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CALIFORNIA HIGHWAYS and PUBLIC WORKS

Official Journal of the Department of Public Works
State of California



November
1927

Castle Rock on State Highway
North of Santa Monica, Los Angeles County



ALONG THE KERN RIVER.

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DONNER MEMORIAL BRIDGE.



You and I have a splendid task before us. We have gone a long way forward in California—gone forward inspired by the hearty approval of a people whose heart is fundamentally sound, whose ideals are fundamentally high. In fairness to that people, there must be no backward step. We must hold all the ground we have gained in the past. We must press on to new achievements for the future. We must keep pace with the growth of a growing world.—From Governor Young's Inaugural Address.

TECHNOLOGY
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The Why of Coordination

By C. C. YOUNG, Governor of California.

THE creation of the Department of Public Works represents an effort to bring about a better coordination of various divisions of the government of California, the activities of which are more or less allied. Through such coordination it is hoped that cooperation can be increased and duplication decreased; that efficiency can be promoted and waste reduced to a minimum.

The newly created Department of Public Works assembles in itself those agencies of the state government which are largely concerned with engineering problems, and which maintain engineering staffs commensurate with the activities with which they are entrusted. The better coordination of these agents permits the mass concentration of engineering and technical forces of the state upon perplexing problems that may arise within any division.

The advantage of this will become apparent when the agencies of the state government included in the department are enumerated. These are:

- Division of Highways.
- Division of Engineering and Irrigation.
- Division of Water Rights.
- Division of Architecture.

In addition to these major divisions the department is also entrusted with the enforcement of the provisions of the State Carey Act, which provides a procedure for the reclamation of desert public lands, and also provides for engineering investigations in cooperation with the United States. The department also is charged with the care of the ports of Eureka, San Diego and San Jose, and, for the next ten years, with the maintenance work of the State Reclamation Board.

The vital interest of this department to the people of the State of California should be apparent at a glance. The coordination of the various governmental agencies enumerated above into one department should reduce, and is reducing, the amount of lost motion, eliminating useless duplication both in money and

in labor, and increasing the efficiency with which the work of the state is being conducted.

The plan fits admirably into the newly established cabinet, or council, system of California, as it enables the activities of these various divisions to be clearly and comprehensively presented to the attention of the Governor of the state and the members of his council.

The creation of the Department of Public Works is but a part of the general revision of California's government that this year has seen. The general reason for this reorganization of the activities of the state can be seen at a glance. In this connection, it may be in order to repeat here what I have recently said elsewhere:

GOVERNOR C. C. YOUNG believes thoroughly in the doctrine of putting more business into government. He tells here the reasons for the creation of the State Department of Public Works and for the other coordinated departments of California's state government, created by enactment of the last legislature in bills suggested and signed by him.

"As the state's activities became more and more complex a very large number of boards, commissions and institutions were created, and a very large number of officials employed, all operating independently of one another, all appointed by the Governor and responsible to him, all theoretically

under his direction, but so many and so varied that no one of them has been able to receive any adequate share of his attention. Finally there had arisen more than a hundred of these governmental agencies, each of them performing a function so essential that it must of necessity be maintained, yet, when taken together, so many in number that proper supervision seemed impossible.

Moreover, there was much wasted effort, since many of these agencies were so inter-related in their nature that their functions often overlapped. There was also frequent conflict when work done by one agency failed to harmonize with the work carried on by another. Then too there were natural rivalries among the various agencies as to the relative amount of state support to which each was entitled. Altogether it presented an impossible situation for which a

(Continued on page 4.)

Our Job

Building California is the job of the Department of Public Works, says Director Bert B. Meek. It requires a big effort and a big consecration. In the article below, Mr. Meek tells what he thinks of the work. It is not a task, he says, for "Yes-men" and "Amen-ers," but for men and women of informed opinion and independent judgment, devoted to the service of California.

By B. B. MEEK, Director, Department of Public Works,
State of California.



B. B. MEEK

THE THOUGHT that I would convey to every official and every employee of the Department of Public Works in this, the first issue of CALIFORNIA HIGHWAYS AND PUBLIC WORKS, is that YOU form the BUILDING branch of the state government of California.

To be a builder is a great thing.

To be a BUILDER OF CALIFORNIA should be sufficient to enthrall the imagination, arouse the ambition and enlist the energy and the efforts of every one to whom has been given the privilege of such service.

For IT IS a privilege to have an active part in building California into the great commonwealth that geography and nature both intended it to become.

And as the privilege is great, so is the responsibility.

To those of us to whom is now entrusted the responsibility of building the highways of the state; of developing its water resources; of planning, designing and constructing its public buildings, the thought should ever come that if we do our work well, the prosperity, the well being, the happiness of the people of this state for centuries to come will reflect the fact that our service was well and honorably performed.

And it is in these terms of human value that I would ask those who are connected with the department to view their tasks.

When pouring concrete or spreading asphalt, we are building not roads alone, but we are also building happiness, contentment, comfort, patriotism and loyalty into the lives of a whole people.

And so it is with every activity of every division of this department. It is PEOPLE whom we are building and not things.

I never pass through the capitol grounds, but my hat is off to the men who designed the beautiful state capitol, and who mapped out and planted the wonderful capitol park.

They were men of vision.

At a time when architecture was marked with elaborate design and when ornateness ran rampant, these men saw the permanent beauty and enduring charm of simple stateliness.

And then there were the other men, the builders of the capitol park, who planted shrubs, vines and trees for the enjoyment of generations then unborn.

Few of us know their names, but all of us are richer in our lives by reason of their service.

And so to you. Builders-of-the-California-

That-Is-To-Be, I would commend vision to see and the wisdom to know the importance and permanence of the work in which you are engaged. Give to California the best of whatever, ABILITY, AMBITION and DETERMINATION that is in you to give.

Coordination, cooperation has been the very proper and wise demand that Governor Young has made upon me. It is also my request to you.

Cooperation in coordination must mean to you the very certain and definite things that it means to Governor Young and to me. I might enumerate specifically what this, the keynote and the slogan of our work, demands from us.

It means that—

The department is entitled to your best and independent judgment on all matters that affect your work here. This is no place for "Yes-men" or "Amen-ers."

We must be willing, yes anxious, to work with others, knowing that the job is too big for any one person.

We must give some thought to the other fellow's problems, and in our turn must be willing to accept suggestions from the other fellow. An outside viewpoint sometimes corrects an opinion, faulty by reason of being formed from "too close a close-up."

We must recognize that the interest of this glorious state of ours always comes first.

We must realize that primarily we are dealing with human values.

We must BELIEVE in the California that has been, that is, and that is to be.

Therein is the code for the conduct of our duties.

Accept it as a challenge or receive it as a religion, as you wish.

Be that as it may be, it is the steel tape by which the usefulness of each and every one of us engaged in this work must and will be measured.

THE WHY OF COORDINATION

(Continued from page 2.)

remedy was obviously demanded. Some years ago California made a preliminary study of this problem to determine whether it might not be possible to organize these agencies into governmental departments. At that time only a beginning of the work was accomplished, and since that time until this year nothing of the kind has been attempted. This year however, our chief constructive task has been this reorganizing and departmentalizing of the state government.

Already nine of these departments have been organized and are actively at work. It is proposed to complete this program by adding two more at the next session of the legislature. Except for a very few boards which can be departmentalized only by constitutional amendment, the hundred or more independent activities which existed a few years ago will hereafter all be merged into eleven well defined, coherent departments of the state. Please do not understand me to claim that by the organization of these departments and the creating of this council I have automatically solved all the governmental problems which will come before me. I do know, however, that in no other way could I have gained such intimate knowledge of these problems, or such a feeling of confidence that by the help of my fellow workers a proper solution for each may ultimately be found. I feel that by this reorganization we have gone a long way toward putting the business of the state on a sound and business-like basis."

So much for the organization of the various departments of our state government, including the Department of Public Works. Now for the personnel of the latter; for the best system of government that human ingenuity can devise will fail if it is not properly operated. The human equation in government always has been and always will be the factor which determines whether government is good or bad, economic or wasteful.

It gave me great pleasure to name as Director of the Department of Public Works, Mr. B. B. Meek of Oroville. Mr. Meek has a wide acquaintanceship with California and its people. He has a long record of honorable and able public service, both in the state legislature and as a member of the State Board of Prison Directors. He is experienced in the administration of large business affairs. He has been successful in the conduct of his own business, a most excellent recommendation for any public servant.

Given the loyal support of the men and women working with him in the Department of Public Works, I believe that the next few years will be not only years of outstanding progress, but also that, when Time writes the final story of the accomplishments and achievements of the department, the tale will be told in terms of a service to the state so well and so honorably performed that the people of California will be its beneficiaries for all time to come.

Tree Planting and Public Utilities

By the Maintenance Department.



THE Maintenance Department of the Division of Highways has under its supervision all matters relating to permits for work or encroachment on the state highways. Very little publicity is given this branch of administrative work, but its extent may be realized from the fact that some four thousand permits were issued during 1926, the cost of special investigation by the district offices and necessary detail being \$13,000. The limitations imposed by these permits on overloads and private encroachments

insure a protection to the highways and their development which amply justifies the expense involved.

Regulations governing the placement of roadside trees and public utilities are of particular interest, presenting as they do a conflict of the aesthetic and commercial when located within narrow rights of way.

Many individuals and organizations have interested themselves in highway beautification, some 685 miles of highways having been

(Continued on page 30.)

State Highways—Past, Present, Future

By RALPH BULL, Chairman of the California Highway Commission.

DESPITE the intermittent manner in which the state highways of California have been financed in past years, the state has proceeded to construct highways to an extent unthought of when the first state highway bond issue was passed.

The problems during the first period of state highway construction had to do chiefly with the selection of routes and designing types of paving.

Traffic and service have justified decisions of the commissioners in the selection of routes, decisions often preceded by sectional controversies.

Time has in many instances justified the type of pavement selected, at times being widened as traffic increased without loss of the original investment. The durability of these first roads against an undreamed of increase in traffic volume and the traffic load is one of the outstanding features of the history of the California highway system.

The second period of highway history was characterized largely by reconstruction activities, widening and thickening the pavement first laid, and the development of new maintenance methods. We are still in this period, with much of this work yet to do.

Another period, however, can be seen in the offing. Impending problems confronting those in charge of California's state highways have to do with:

Securing wider rights of way to provide adequate traffic lanes for present traffic and for the enormously increasing traffic that the very near future promises;

Completion of highways in the more remote sections of the state;

Removal of traffic barriers in places of present traffic congestion;

The more rapid elimination of grade crossings.

These problems have to do with the construction of our highways.

Very fortunately the most acute problem of all—that of financing new construction—was solved when Governor Young affixed his signature to the one-cent gasoline tax, the proceeds of which are to be devoted to new construction. This measure is important, not only for the revenues that it will make available for building roads, but also because it establishes a policy of continuous financing for our highways.

The California Highway Commission is hopeful that construction, reconstruction and maintenance may all move forward in a manner that will adequately meet the traffic responsibilities of California's magnificent highway system.



RALPH BULL

If you are going fifty miles an hour you are doing 73.33 feet every second of time and it will take you, at the best you can do, nearly a city block to get stopped. At seventy-five feet per second do you wonder that you and your car can be off the road, in the ditch,

upside down, and you dead, inside of a single second?

The value of scientific research in industry is well illustrated in the tremendous savings which have been made in Illinois in the construction of 2500 miles of hard surfaced roads since the Bates Experimental Road Tests in 1922. It is estimated by officials of the State Highway Department that these savings amount to approximately \$3,600 per mile, making a total saving of \$9,000,000 to the state.—*Pacific Street and Road Builder*.

Putting the "Right" into Water Rights

Division of Water Rights Duty Is to Encourage the Use of Water and Prevent Its Monopolization

By HAROLD CONKLING, Chief of the Division of Water Rights.

THE Division of Water Rights of the State Department of Public Works has charge of the important work of supervision over the acquisition and definition of water rights, the administration of streams, *i. e.* distribution of water, and investigation of water rights and water right resources.

A few figures will indicate the amount of business that this brings into the office, and the manner in which the waters of California are made available for development and yet at the same time are safeguarded against speculative retention without actual development.

5744 APPLICATIONS

Prior to November 1, 1927, the division had received a total of 5744 applications seeking to appropriate a total of some 959,439 cubic feet per second and 168,201,972 acre-feet per annum.

Approximately 43 per cent of the applications received are canceled and 57 per cent are approved.

Of those approved approximately 50 per cent are subsequently revoked and 50 per cent proceed to license and so far some 7 per cent of those licensed have been revoked.

In connection with the amounts of water applied for it may be stated approximately 10 per cent only is allowed and 90 per cent disallowed either on account of voluntary withdrawal of the application, failure to complete the application, or for lack of unappropriated water or some other sufficient reason.

Of the amount of water allowed use is never completed in connection with 58 per cent of the direct flow and 90 per cent of the storage and permit is revoked before license.

These figures indicate in a general way the weeding out process which clears the way for later development by disposing of uncompleted appropriations.

TWOFOLD RESPONSIBILITY

The powers and duties of the division are administrative and quasi judicial in character, having as their ultimate objective the delivery of public waters of the state to those entitled to their use.

PROCEDURE

In connection with its supervision over the acquisition of rights to appropriate, the division receives applications, works out a clear definition of the proposed projects, advertises them, hears protests and in each case either rejects the application or approves by the issuance of a permit. If a permit is issued a reasonable time is allowed for beginning and completing construction and completely applying the water to beneficial use. If the water is not so applied to beneficial use permit is revoked, and if it is so applied a license is issued confirming the right of permittee to such an amount of water as was



HAROLD CONKLING

found upon inspection by an engineer of the division to have been actually applied to beneficial use.

The Water Commission Act provides two procedures for definition of water rights. Under section 24 of the act any suit pending in a superior court involving a determination of water rights may be referred to the division for investigation as a referee. Under sections 25 to 36f, inclusive, of the act the division may itself without reference from a court undertake an adjudication of appropriative rights either upon its own initiative or upon petition signed by one or more claimants. The proceedings and functioning of the division are not essentially unlike under the two different procedures specified in the act once the work of determination is undertaken. An investigation is made including

(Continued on page 31.)

Building California's Buildings

How the State Conducts a \$4,000,000 Building Program

By GEO. B. McDOUGALL, Chief of the Division of Architecture.

DURING the fiscal years of 1927-28 and 1928-29, California will expend well over \$4,000,000 upon its building program. The expenditure of this large amount is not being carried out in a haphazard manner, but in accordance with a carefully prepared plan recommended to the legislature by Governor Young, and approved by that body.

This building program contains a total of ninety-six major projects scattered all over the state, and representing almost every type of building. The cost of individual projects ranges from \$260,000 to \$350.

The execution of the program is entrusted to the Division of Architecture of the State Department of Public Works. It may be of interest to know something of how the division operates and of the duties imposed upon it.

The activities of the Division of Architecture and the former Bureau of Architecture cover a period of approximately nineteen years.

During the first few years of its existence the work of the Bureau of Architecture consisted almost entirely of the preparation of plans and specifications for new buildings, repairs and alterations to existing buildings, and general supervision of the construction thereof. The work was therefore similar to that of the average architect of private practice, except for the fact that construction has in most cases been at a considerable distance from the central office. As the years have passed, however, the responsibilities have constantly increased, as has also the number of institutions and general building activity in the state, until the present large force is required to handle the work. The duties of the Division of Architecture at the present time may be summed up as follows:

To make plans and specifications for all

new buildings of a value in excess of \$1,000 at the various state institutions; to let contracts for and superintend their erection, or, in case satisfactory contracts can not be made, to construct the buildings by day labor; to care for all alterations and repairs to existing buildings on the same basis where the amount

involved is in excess of \$1,000: to design and install all heating, lighting, ventilating, refrigerating, water supply, mechanical and electrical plants of every nature—whether changes, extensions, or original; survey grounds, lay out walks, drives and roads; provide water supply, sewer and drainage systems, requiring the design and construction of dams, reservoirs, pipe lines, wells, pumping plants, ditches, sewage treatment and disposal plants and drains.

OPERATION OF THE DIVISION

Under the subject of operation, the activities of the Division of Architecture can be listed under three main subdivisions:

1. Construction by contract or subcontracts.
2. Construction by day labor.
3. Miscellaneous activities.

When working drawings for a project are started in the drafting room, a decision is made by the executive head of the division on the method of construction to be followed; that is, whether the work shall go ahead on a basis of contracts, subcontracts, or day labor.

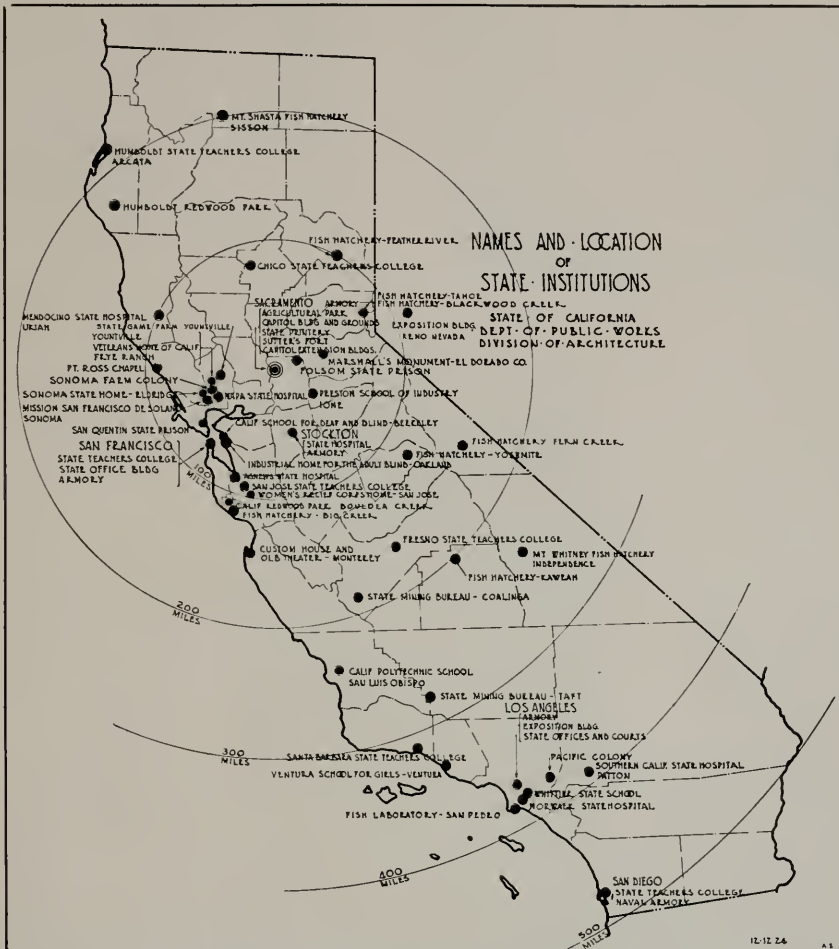
It is the policy of the state to construct its buildings under contracts. The day labor method is resorted to only where money can be saved to the state, either on account of the nature of the work itself, because of isolated locations, or in the case of work at institutions where patients or inmate labor is available.

(Continued on page 30.)



GEO. B. McDOUGALL

Carpentering over California



Upper view shows statewide scope of the activities of the Department of Architecture. Lower view is that of cottage for patient-workers in the Southern California State Hospital at Patton.

Highways are California's Arteries, and Water Is Its Life Blood

By EDWARD HYATT, JR., State Engineer of California.

THE position of California among the wealth producing states of the nation is directly attributable to the phenomenal growth of agriculture in this state, which has been brought about by the scientific application of water to the land and the intensive and intelligent cultivation of the soil by the California farmer.

The limit of profit by dry farming was reached in 1885, and it is since that time that irrigation has been intensively practiced in the State of California. The phenomenal growth and expansion of irrigated areas necessitated the construction of dams, diversion works, canals and other works of such magnitude that their initial cost prohibited their being undertaken by individuals. Their construction and financing has been accomplished through associated effort, which has been made possible through the California Irrigation District Act, passed in 1897 and amended in 1913, and the California Bond Certification Act, passed in 1913.

These acts provide for the approval of organization of districts and supervision of construction by the State Engineer, and the approval and certification of bonds by the California Bond Certification Commission, of which the State Engineer is a member.

BIG PART IN WORK

The Division of Engineering and Irrigation is and has been closely associated with the phenomenal growth of California, which is among the leading wealth producing states of a nation which leads the world in agriculture. During the past generation most of all the proposals for irrigation development undertaken by collective effort have had their adequacy and general merit concurred with, if

satisfactory, or rejected, if defective, by the division.

HUGE INVESTMENTS APPROVED

In carrying out its statutory functions millions of dollars worth of improvements are approved every year by the Division of Engineering and Irrigation. It analyzes and



Edward Hyatt, Jr., State Engineer, pictured as he was showing Legislative Committee a northern California dam site.

passes upon plans of irrigation, drainage, water storage, water conservation and reclamation districts. The certification of irrigation district bonds by the California Bond Certification Commission is based upon investigation made by the State Engineer. The Division of Engineering and Irrigation is charged with the approval of plans for dams other than those constructed by a municipality or public utility and with the construction of river control works and rectification of channels, of which the Sacramento River carries the highest valued tonnage of any river in the United States. It makes hydrographic surveys and cooperates with the Reclamation Board in passing upon plans of reclamation and drainage districts, with the United States Geological Survey in gaging streams and

making topographic maps, and with the United States Department of Agriculture in needed investigations.

WORK IS DIVERSIFIED

The functions of the division are widely diversified in character, some administrative, some specialized, others executive, but all constructive and contributing to the advancement and well-being of the state. The principal statutory functions may be summarized as follows:

1. To investigate and report on feasibility of proposed irrigation districts.
2. To investigate and report on proposed bond



Don Pedro Dam on the Tuolumne River.



Melones Dam on the Stanislaus River.

issues by irrigation districts before the California Bond Certification Commission for approval, of which the State Engineer is a member.

3. To supervise expenditure of funds from approved bond issues and to inspect generally the construction work of irrigation districts.

4. To collect data, make surveys and perfect plans for flood control of the Sacramento and San Joaquin rivers in conjunction with work of State Reclamation Board, to review plans for reclamation, and to advise and assist the board. The operation and maintenance of the flood control project for which the legislature appropriated \$150,000 in 1927 has been assigned to the Division of Engineering and Irrigation by the Director of Public Works.

5. To maintain and operate all weirs on the Sacramento River.

6. To investigate feasibility of water storage dis-

tricts, the fixing of their boundaries and passing upon their organization.

7. To investigate the feasibility and organization of water conservation districts. The State Engineer is chairman of the irrigation board.

8. To pass on plans and specifications of dams, and to supervise the construction of dams, by other than municipalities or public utilities.

9. To designate the width of draw, and the length of span for bridges across navigable streams.

10. To plan and construct works for rectification of river channels and protection of property from flood damage on the rivers of the state.

11. To direct cooperative stream gaging, topographic surveying and irrigation investigations in cooperation with the federal government.

(Continued on page 34.)



Exchequer Dam on the Merced River.

The "Oil Mix" Method

By T. E. STANTON, Assistant State Highway Engineer, California.

TREATING roads with asphaltic oil is not a development of recent years.

In California, where an abundance of asphaltic oil is available locally at a low cost, we have been oiling our roads with more or less success for over thirty years.

Many states can undoubtedly produce evidence of similar practice.

Most of the early work of this nature, however, was allowed to deteriorate through lack of proper and intelligent maintenance, with the result that oil surfacing of natural soil or gravel roads came to be looked upon by the general public as more or less of a failure and the tendency has been to replace these oil roads with expensive hard surfaced pavements as rapidly as traffic requires and funds are available.

As motor traffic has increased however and highway engineers have come to realize the great economic waste involved in permitting water-bound gravel and crushed rock roads to be loosened and blown away through the joint action of vehicles and winds, a strong movement has set in all over the country towards sealing the surface so as to make it impervious to such destructive agencies.

Instead, however, of using the haphazard methods of the past, the engineer has come to the conclusion that the problem is deserving of as much scientific and intelligent study as had been applied to the more expensive types of hard surfaced pavements, and as a natural corollary we have the rapid strides towards a full understanding of the problem which have been made in recent years.

To Oregon must go the credit in the west of being the first state to go extensively into the use of an asphaltic oil, relatively low in asphalt content (60% to 70%), locally known as "fuel oil," in surfacing the gravel and crushed rock roads of the state by what is known as the surface treatment or penetration method; and to California the credit for most

of the progress which has been made to date in the so-called "oil mix" method.

OIL MIX

Surface oiling is only successful where the base is firmly bound and all loose material on the surface can be eliminated by brooming. The base can be placed in a properly bound condition only when the rock from which it is made has cementing qualities of a high order or there is suitable material available which has a high binding value.

In many of the arid and desert regions of California no good cementing base rock is available, nor is there any suitable local clay or other binding material. In these sections it is impossible to secure a base sufficiently stable to enable the surface oiling method to be adopted with any success.

We were forced in such cases to either abandon the use of oil altogether or to adopt some other process than the penetration method. As a result, the oil mix method was de-

veloped. The use of this method, while particularly adapted to sections where there is no good binder available, is being extended to cover crushed rock roads in other sections of the state, where, even though good binder may be available, it is desired to immediately oil a base in such rough condition that it must be scarified several inches in depth in order to properly smooth up or where it is desired to oil a new road surface before traffic has had time to thoroughly compact the base and surface material.

ASSURES SMOOTHER SURFACE

Those who have become expert in this method of oiling prefer it to the oil surface method, as a smoother riding surface can usually be secured and the resultant maintenance cost under average conditions is somewhat less, owing to the fact that when the work is properly done practically no surface patching is necessary.

PROBABLY the most notable contribution of California to road building methods during the past few years has been the development of the "oil mix" method of treating roads surfaced with gravel and crushed rock.

In this paper T. E. Stanton, Assistant State Highway Engineer of California, describes in detail this method of treating roads. In the next number of California Highways and Public Works Mr. Stanton will tell of the surface or penetration method of treating these roads with oil, a method that has been used largely in California, but which has been chiefly developed in Oregon.

Pictures Tell Story of "Oil Mix"

1 1 1 1 1 1



Step
One—
Heavy
scarification

Where the grading of the base material shows approximately 50 per cent fines passing the 10 mesh approximately one-half gallon of oil per square yard per inch of depth is required under the mixing method or a total of one and one-half gallons for a three-inch mat, as against approximately one-half gallon total in the case of the oil penetration method. The cost of oiling is increased to this extent. On the other hand, an appreciable saving is made in the cost of screening, which is unnecessary in the oil mix method.

The mixing method produces a layer of mineral aggregate and bitumen closely akin to asphaltic concrete. The same principles of grading affect its stability. Skilled workers can produce an oiled surface which is as smooth as the surface ordinarily attained with asphaltic concrete.

METHOD OF CONSTRUCTION

The method of construction is briefly described as follows:

If the existing road has a rough or unequal surface it is first scarified lightly and then smoothed by grading or dragging loose material into depressions.

After this preliminary smoothing, the road is scarified to a uniform depth of two to three inches, according to the thickness of bituminous surface desired.

Sixty per cent to seventy per cent fuel oil is applied in two or three applications, each consisting of about one-half gallon per square yard.

The oil is mixed with the loose material after each application by means of a disc harrow, sometimes followed by a spring tooth harrow.

As soon as the oil distributor starts the disc

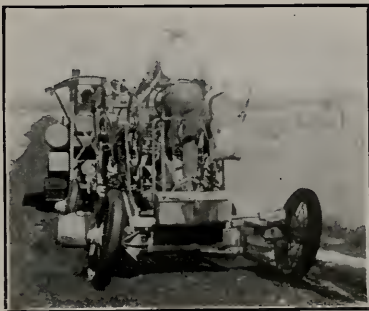
(Continued on page 32.)



Step
Two—
Oiling



Step
Three—
Disk and
Harrow



Step
Four—
Thorough
Mixing



The Finished
Road

SOME PROBLEMS OF COORDINATED WATER

The wide diversity of local conditions in California was well illustrated during the recent investigational tour of northern California counties by the joint legislative committee appointed to investigate the coordinated plan for the development of California's water resources.

Every hearing held by the Legislative Committee developed a new phase of the water problem.

Early in the meetings Bradford S. Crittenden, chairman of the committee, took occasion to carefully explain that the coordinated plan simply had to do with the disposition of stored surplus waters of the state, after the ultimate local use had been fully protected. He then asked that representatives of the communities should voice their opinion both as to the state and the local aspects of the question.

They did so. Here are seven of the local questions raised by different communities during the hearings:

1. Should the use of water for recreational purposes be considered a major use for water in California along with domestic, irrigation and navigation uses? Should not a reservation of water for recreational purposes be considered in a plan for the ultimate development of the originating areas?

2. Should the reservation of water for foothill areas be made upon the basis of the acreage to be served, or upon the basis of any estimated period of time for the development of such land?

3. Should the interests directly benefited by the proposed coordinated development bear its entire cost?

4. Should any portion of any of the proposed reservoirs be assigned for use in impounding tailings from hydraulic mines?

5. Should state coordination precede or follow the development of water projects in local units?

6. Is there an assured market for the power that would be developed as a by-product under the plan? How should such power be marketed?

7. If it should appear that the state's coordinated plan would prevent the development of a project by private capital, well in advance of its contemplated development under the state system, should the state plan be allowed to prevent such proposed private development?

A FEW THOUGHTS ON SPEED AND SAFETY

And now we have another plan to reconcile speed on the highways with safety to travel.

This time the president of an eastern automobile association is the father of the idea.

The crux of the whole matter lies in "synchronizing."

The hand on the wheel, the foot at the accelerator, and the brain behind both are to be synchronized.

Then the driver can speed at whatever speed he may desire and the speed cop will permit, with complete safety to other autoists on the highway.

One difficulty of course is the inability of ascertaining before the crash comes whether the sixty miles an hour that the other fellow is making is the result of his being synchronized or gin-chronized.

And again, there are the petters.

The driver with one arm at the wheel and the other around his sweetie may sizzle, but he can not synchronize foot and hand with a brain behind neither.

If petters were rewarded for parking off highway, instead of penalized for so doing, the peril of the petter would probably be averted.

But for the gin-chronizer the only thing to do is to make it a jail offense either for him or his car. Drunk or sober, actually or potentially, he is and will always be a menace to himself and a peril to everyone else on the road.

And now for the second point in the new plan for making our highways safe.

"We can not educate or penalize the car," says the authority referred to above. "We must stress the human equation."

This brings up another phase of the speed problem.

Our own thought is that human equations, particularly those of tender years, who persist in tearing down the roads at a reckless rate of speed, need spanking more than stressing. And speaking both from experience as a spankee and a spanker, our further observation is that in spanking the human equation, the nearer to the human equator you spank, the more effective the results are.

Free the highways from the gin fools, and the petting fools and the irresponsible speed fools, and high speed upon the part of careful drivers may be harmonized with safety to others.

Hope lies in the fact that there is one place where this condition exists.

But the streets thereof are paved with beaten gold.

Legislators View Northern Dam Sites

CALIFORNIA, what of your water?

This was the question that the Joint Legislative Committee of the Water Resources of California carried to northern California on a trip of inspection and investigation that began on Monday, October 17th, and concluded a week later.

The purpose of the trip was to acquaint members of the committee with the situation in northern California from actual inspection on the ground, and to acquaint the communities of the north with both what the coordinated plan for the development of California's water resources proposes to do and what it proposes not to do. Mr. Edward Hyatt, Jr., State Engineer, accompanied the committee on its tour, pointing out on the ground physical features of the proposed development; explaining to the communities the underlying principles of the coordinated plan, and answering questions from both members of the committee and interested citizens.

THE ITINERARY

The committee and its party left Sacramento, Monday afternoon, October 17th. From Sacramento the party proceeded to Santa Rosa via Benicia; from Santa Rosa to Eureka; from Eureka to Redding via Weaverville and the projected Fairview Reservoir on the Trinity River; from Redding to the site of the dam for the proposed Kennett Reservoir and thence to Red Bluff; from Red Bluff to the Orland project; thence to Willows; thence to irrigation district pumping stations along the Sacramento River, and thence to Oroville. From Oroville the party went to Grass Valley via the Bullard's Bar and from Grass Valley to Marysville. The concluding day's trip took the committee from Marysville through the developed foothill areas of Placer and El Dorado counties to Placerville and thence back

to Sacramento. A total of 1045 miles were covered.

Hearings were held by the committee at Eureka, Redding, Red Bluff, Willows, Oroville, Grass Valley and Placerville. Enroute to Santa Rosa stops were made for a cursory examination of two proposed and alternative sites for the erection of salt water barriers, but as this territory is to be covered in a later trip, the inspection was only casual in its character.

The committee plans to inspect the delta area, proposed salt water barrier sites and the San Joaquin Valley in a later trip.

OPEN DECISIONS OPENLY REACHED

In the hearings, Chairman Crittenden of the committee explained that the desire of the committee and the Department of Public Works was to ascertain all the facts concerning the plan, that whatever policy might be recommended by the committee and the department might be based upon a fair and complete knowledge of engineering data, financial facts and legal questions involved.

Mr. Hyatt in his turn explained the outstanding features of the proposed coordinated plan. Representatives of the various communities were then asked to state their views and opinions both as to the plan as far as it affected the state and as far as it affected their local interests.

SURPLUS WATERS

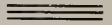
In the statements, both of members of the committee and Mr. Hyatt, the fact was emphasized that the plan proposed no diversion of waters from any watershed upon which such water originated without a guaranteed reservation of sufficient water to provide for the ultimate development of such originating areas.

(Continued on page 18.)



Bradford S. Crittenden, Chairman of the Joint Legislative Committee on the Coordination of the Water Resources of California.

TITANIC DAMS IN WATER PLANS



THE UPPER VIEW is that of the site for the Boulder Canyon Dam on the Colorado River. The report on coordination of the water resources of California advocates the construction of this dam to offset the deficiency in the natural water supply of southern California and to control floods on the lower Colorado River. A dam here 550 feet high would create a reservoir impounding 26,000,000 acre-feet of water.

The lower view is the Kennett dam site on the Sacramento River above Redding. A dam here 425 feet high would impound 2,900,000 acre-feet of water. Increased to 600 feet in height, the dam would impound 9,000,000 acre-feet of water.



LEGISLATORS VIEW NORTHERN DAM SITES

(Continued from page 16.)

HIGH LIGHTS IN REPORT

Here are the outstanding facts of the plan for the coordination of California's water resources:

Three-fourths of all the state's waters reach the ocean within forty-five days after the time of their precipitation as rain or snow upon the mountain areas.

Practically all the summer flow of California's streams that are accessible, is now in use. Further advancement is attendant upon the construction of reservoirs that will make available for use at the needed time, the great volume of winter and spring run-off of normal years.

Ample water originates within the state's boundaries for all future needs but it is very unequally distributed geographically. Three-fourths of all water lies within the northerly third of the state's area, while three-fourths of the need for water lies in the southerly two-thirds of the state's area.

There is some water available to California in addition to that originating within the state's boundaries in the Colorado and Klamath River systems. Of these, however, the Colorado River is the only one geographically situated to alleviate the very unequal distribution of the waters.

Cities of fairly mature growth use water about equal in amount to that required for irrigating crops on the same area. Accordingly a plan that will provide an adequate allotment of water for all the agricultural lands, together with additional amounts for urban expansion about the state's seaports, will meet the future demands for water in the maximum development of the state's resources.

At the present time, ninety-six per cent of the water consumed in California is utilized in irrigating farm lands.

The importance of municipal, industrial, navigation, hydro-electric and mining uses in the future growth of the state requires liberal provision for their needs.

The approach to exhaustion of local supplies in many parts of California presents even more serious aspects than the loss of anticipated wealth through curtailment of expansion. Large areas deriving their supply from underground sources are facing a dropping ground-water plane.

The coordinated plan provides for the storage of flood waters for conservation purposes, the transportation of surplus waters of the

Sacramento drainage basin to the deficient areas in the San Joaquin Valley, an adequate summer flow in the Sacramento River for navigation and salt water control, the resumption of hydraulic mining in the Sierra Nevada Mountains, the control of floods by reservoirs, the expansion of irrigation along the lower Colorado River in southeastern California, and the diversion of water from that river to the Pacific slope for municipal purposes.

The coordinated plan for the Sacramento Valley comprehends the solution of all these public problems, water for navigation and salt water control, the reduction of flood flows, and the restraint of mining debris, while at the same time providing for the increasing demands for irrigation water.

The new supply for the San Joaquin Valley would be derived from the water used to maintain navigation in the channel of the Sacramento River. After serving its useful purpose in the Sacramento Valley, this water would be diverted at the mouth of the river into the San Joaquin. Passing through the channels of the island region forming the delta of the Sacramento and San Joaquin rivers, it would be boosted up the main channel of the San Joaquin by a series of pumping plants, each one pumping the water over a low dam to the higher level of the pond behind it. These dams would be collapsible so that they would not obstruct the channel during the flood season. They would be so located that, if desired, locks could be constructed along side them that would make the San Joaquin River navigable for a distance of 160 miles from its mouth. This series of dams and pumping plants, extending the length of the main channel on the valley floor, would also constitute a means of conserving the scant water supply of the San Joaquin Valley.

The new supply of water obtained through the operation of these dams and pumping plants would be distributed to the lower lying lands in the San Joaquin Valley in order that the pumping lift may be a minimum. This would increase San Joaquin water now used on these lower lands, at high elevations for diversion by gravity to the lands in the southern San Joaquin Valley that need more water. In this manner, the new supply could be obtained with a maximum pumping lift of 160 feet. The exchange of waters would save 340 feet of pumping lift.

In diverting the water used for navigation in the Sacramento River to the San Joaquin, a certain portion would escape into Suisun Bay unless a physical barrier were constructed below the junction of the two rivers. Investigations of the cost of such a barrier have been

completed recently in cooperation with the United States Bureau of Reclamation. These reveal that the probable cost would vary from \$45,000,000 to \$90,000,000 according to the site selected. This exceeds considerably the cost of developing the volume of water that would escape into Suisun Bay if no barrier were constructed. At some future time when this volume of escape water is needed for irrigation in the San Joaquin Valley, a physical barrier could be constructed in order to make it available. In the meantime, the escape of this water into Suisun Bay would automatically dispel the menace of incursion of salt water into the channels of the delta region.

California, southerly from Tehachapi Pass, embraces twenty per cent of the area of the state that is favorable for human habitation, while but little over one per cent of the state's waters, exclusive of the Colorado River, are tributary thereto.

A survey of the available water, both surface and underground, shows that four-fifths of the local supplies on the Pacific slope of southern California, excluding Owens Valley, are now in use. Utilizing four-fifths of the available local water, less than half of the favorable area is occupied by cities or towns and irrigated lands.

The construction of the Boulder Canyon dam is one of the most important issues before the public at this time for the deficiency in the natural water supply of southern California and the control of floods on the lower Colorado River is a matter of serious concern.

In the study of southern California supplies, special attention has been placed upon the coordination of surface storage in reservoirs, the control of floods, and the replenishment of the underground basins from which such a large part of local water is obtained.

FOLLOWS LONG STUDY

The coordinated plan for the development of the water resources of California is the result of six years investigation and study upon which approximately \$450,000 has been expended.

The report was submitted to the legislature of 1927 by Paul Bailey, then Director of Public Works. Signing the report with him were Louis C. Hill, J. B. Lippincott, Wm. Mulholland, A. J. Cleary, G. A. Elliott, B. A. Etcheverry, F. C. Hermann, Walter L. Huber, A. Kempkey, members of the Engineering Advisory Committee. Cooperating with the committee were F. E. Bonner, L. S. Ready, and C. B. Ridley.

The survey of the water resources of the state was made in consultation with C. E. Grunsky, Louis C. Hill, Charles D. Marx, H. D. McGlashan. Estimates of the water required for the full development of the state's resources were prepared in consultation with A. N. Bruch, B. A. Etcheverry, Samuel Fortier, and A. L. Sonderegger.

The first report on these investigations rendered to the 1923 legislature was prepared with the advice of a citizens committee appointed by Governor Stephens, as follows: J. C. Forkner, chairman, Peter Cook, Jonathan S. Dodge, B. A. Etcheverry, Harry Hawgood, H. A. Kluegel, Robert B. Marshall, H. D. McGlashan, O. B. Tout, U. S. Webb.

BULLETINS ON SUBJECT

The entire subject is summarized in Bulletin No. 12 entitled "Water Resources of California and a Coordinated Plan for Their Development." The complete report, however, in a series of bulletins, copies of which may be obtained by addressing the State Department of Public Works, Division of Engineering and Irrigation, Sacramento, California. The bulletins are:

- Bulletin No. 3—Water Resources of Tulare County and Their Utilization.
- Bulletin No. 4—Water Resources of California.
- Bulletin No. 5—Flow in California Streams.
- Bulletin No. 6—Irrigation Requirements of California Lands.
- Bulletin No. 9—Supplemental Report on Water Resources of California.
- Bulletin No. 11—Ground Water Resources of the Southern San Joaquin Valley.
- Bulletin No. 12—Summary Resources of the Water Resources of California.

Irene Thomas, pretty typist,
Really made a hit
With her new boss, Dave A. Mayer,
But she had to quit
When he noticed on each letter,
She had signed—DAM-IT.

—Kentucky Highways.

"I've been watching that mechanic for the last fifteen minutes. There's a man that knows his business. He didn't spill a drop of oil on the mudguard. He put down the hood gently, fastened it securely and left no fingerprints on it. He wiped his hands on clean waste before opening the door, spread a clean cloth over the upholstery, meshed the gears noiselessly and then drove slowly and with caution into the street."

"Yeah. That's his own car."—Life.

News of California Highways

GENERAL approbation appears to be accorded to the policy announced by B. B. Meek, Director of the Department of Public Works, to start at the earliest possible time a comprehensive grading and graveling program, which will make available to traffic at the earliest possible time sections of the state highway now unimproved and accordingly closed to travel.

The first stage of the construction under this program will be to grade and drain these roads as rapidly as the work can be carried on. Following this the rock surface will be oiled, for the dual purpose of holding the surface and allaying dust in summer. This will meet current traffic demands upon the roads. As the roadbed settles under traffic and by reason of weathering, and as increasing traffic makes it necessary, arrangements will be made for the installation of permanent pavement on these sections.

It is pointed out that this policy of road treatment will make for a greater stability of the subgrade, with consequent betterment of the permanent surface when the latter is laid.

Past experiments have shown that the oil can be put on the roads at a cost varying from \$1,000 to \$1,500 a mile after the rock surface has been laid. This settles the dust and, after it has been rolled and subjected to the wear and tear of traffic, soon becomes a hard packed surfacing, even though not of a permanent character.

The new plan will in no way retard permanent paving, which will be carried forward as rapidly as funds become available under the new gasoline tax and as the needs justify.

HAD "C. H. C." LANTERN, BUT COURT FOUND HE WASN'T DIOGENES.

On October 19th, Foreman A. L. Andrus noted a truck to which was attached one of our highway lanterns, which in the fifth district are painted yellow with the "C. H. C." on them. Mr. Andrus questioned the driver and upon receiving unsatisfactory answers a warrant was sworn out for his arrest on the charge of petty larceny. The truck was operated by Rudolph Nicola of Soledad, who was brought before Judge Donaldson of Templeton and fined \$20 with alternative of 20 days in jail. This man stated that he was in the habit of picking up highway lanterns and had always returned them.

HIGHWAY HEADLINES

Grading and Graveling Comment.
Fined for Lantern Theft.
Location Policies Told.
Traffic Study of Ridge Route.
Jumbo Does His Bit.
New Roads and the State System.
Asphalt Laid on Asphalt 250,000 Years Old.
District Office Moved to Eureka.
Activities of Prison Camps—Del Norte County Camp Moved—Lake County Camp Being Moved—Mariposa Camp—Prison Camp Population—Future Activities.
Aeroplane Used in Highway Location.
State Highway Progress Reports.

Hearings on Ground Win Approval

The new policy of the Highway Commission of holding its meetings at different points throughout the state, with hearings "upon the ground" rather than in Sacramento, has also been very favorably commented upon by the press of the state. The first meeting under the new plan was held in Fresno on October 20th. Occasion was taken on this trip to hold meetings at a number of places where the people of the various counties, cities and communities had opportunity to voice their opinion as to highway plans, projects and policies, both as they affect the state and the particular communities where the meetings were held. These meetings were held at Turlock, Chowchilla, Fresno, Bakersfield, Hanford and Salinas.

November's meeting will be held at San Diego with other meetings in that section. A general study of the road situation of that section of the state will be made.

Highway Location Methods Told

Much interest has also attached to the announcement of Mr. Meek and members of the Highway Commission that the location of roads will be made upon the findings of engineers skilled in matters of technical and economical highway location. These reports will be made available to the public and to interested communities, but unless the recommendations of the engineers can be shown to be at fault, their findings will be followed in road locations.

Traffic Study Along Ridge Route

Thorough study of traffic conditions along the Ridge route between Los Angeles and Bakersfield will be made immediately.

Road Policies Are Outlined

JUMBO PUSHES CIRCUS OUT OF MUD, BUT CREATES NEW HIGHWAY PROBLEM

There are tears as well as smiles in the story of Jumbo, huge circus elephant, who died last month on the Hauser contract in Humboldt County.

The trucks hauling the circus to which Jumbo was attached, while on the way from Humboldt to Del Norte County became mired in road under process of construction. Efforts to get the trucks out of the mud by their own power were unavailing.

Jumbo was requisitioned into service. He pushed truck after truck out of the mud and from one hole to another until the circus parade was on its way again.

Then Jumbo laid down on the road in a state of complete exhaustion. All efforts to rouse and revive the huge animal were unavailing.

Finally the driver of the elephant went to his charge.

"Time to show, Jumbo," he said. Jumbo flopped his huge ears, and started to rise. "Time to show, Jumbo," said the driver again.

True to the instincts of the showman, that whatever may happen, the show must proceed, Jumbo again tried to get up. But the effort was too much. The show, however, was safe. It was on its way, out of the mud. Jumbo sank back—dead.

Then the Hauser forces buried the faithful elephant. The question now is as to whether the removal of the carcass of a dead elephant from right of way is properly a contingency that a contractor should anticipate in his bid, or should an extra work order cover the cost.

But Jumbo does not care about all that. The circus is safe. There was no failure on his part when it was "time to show."

The feasibility of the construction of a new road will be considered by the department as a means of affording relief for the traffic congestion on the present highway, if the situation can not be relieved by radical changes in the alignment of the present road.

A study of traffic and road conditions on the Saugus Tunnel road has already been ordered. This study is being made with the object in view of affording quick relief to the Saugus Tunnel bottleneck. The extent of travel at this point will be realized when it is stated that the traffic count taken by engineers

of the California Highway Commission on Sunday, July 17, 1927, showed a total traffic flow of 7680 vehicles over this road in a sixteen-hour period.

Tells Policy Toward New Highways

"There is a legal as well as a moral obligation for the California Highway Commission to complete the roads at present in the state highway system, as embraced in proposals for bond issues and in legislative enactments, before we undertake anything else," stated Senator M. B. Harris of Fresno, member of the State Highway Commission, at a meeting held in Bakersfield, in declining to consider inclusion of Tehachapi highway in the state system, at a conference held in that city attended by members of the commission, city and county officials and more than 100 persons interested in highway building programs.

Resolutions of endorsement of the announced policy of the commission were unanimously adopted as offered by Ira Williams, chairman of the Kern County board of supervisors, favoring the completion at the earliest moment of opening all secondary highways in the state by bringing such highways to grade and properly draining the same. Also that

(Continued on page 22.)

Asphalt Top Is Laid On Base Quarter of Million Years Old



Santa Susana Pass, near San Fernando, Los Angeles County, California. Here man-perfected asphalt is laid through a region underlain with an asphalt source estimated to be a quarter of a million years old.

Activities of Prison Camps

(Continued from page 21.)

such highways be paved as rapidly as traffic needs demand, and funds be available.

Division Offices Moved to Eureka

That the work of District 1 of the Division of Highways may be more easily and efficiently directed, it has been found necessary to move the offices of District I and Shop 1 from the building at Willits to temporary quarters in the Bank of Italy Building at the corner of Fourth and E streets in Eureka.

When the Highway Commission was organized, and Division I was formed in January, 1912, Willits was the end of the trail. There was no railroad to Eureka or Crescent City, and only steep, narrow, and tortuous wagon roads existed north of Willits. Willits was therefore the logical location for the division offices at that time.

Division I comprised the counties of Lake, Mendocino, Humboldt, and the most northwestern county of Del Norte.

As new roads were constructed in Humboldt and Del Norte counties and the railroad was extended on to Eureka, it became apparent that the bulk of the work in the division, both for construction and maintenance, was in the northern part. Often during the winter all modes of communication were cut off to the north. Accordingly it became evident that Eureka is now the logical place for the district offices, even though a well established plant must be left behind at Willits for some other use.

In contemplating the movement of district offices, an adjustment of the district boundaries was also considered advisable. Thereupon District III has been given that portion of Route 15 from Upper Lake to the westerly Lake County line and District IV has taken over all the rest of the roads which were formerly in District I south of Willits in lieu of which other territory is to be added to District I.

The equipment shops at Willits are to remain as a sub-shop of District I Equipment Department, and will care for the upkeep and repair of the state equipment in District IV as far south as Petaluma, and north in District I to Garberville.

Activities of the Prison Camps

On October 1, 1927, the Department of Prison Road Camps was merged with the

office of the secretary of the California Highway Commission, thereby ceasing to exist as a separate unit of the Division of Highways. At that time the operation of the prison camps came directly under the supervision of E. Forrest Mitchell, secretary of the commission.

Del Norte County Camp Moved

On October 28, 1927, after three weeks of moving operations, Camp A, which was located near Crescent City, Del Norte County, became Camp 12, located in Shasta County at Green Horn, 21.6 miles west of Redding. The new location is on the Redding-Arcata lateral, which is a primary state highway as far as the town of Weaverville. The men at this camp will for the next two years be engaged in the relocation of the highway from a point at the Green Horn mine over what is known as Buck Horn Mountain. The new location will eliminate a very difficult grade and will conform to all standard state specifications. In all there will be a total of nine miles of new road, providing work for the camp for at least two years.

The men at the camp welcome the move as weather conditions in Shasta are more favorable than those on the Del Norte coast. The work comes under the supervision of District Engineer H. S. Comly, District 11, headquarters, Redding, with the camp now known as No. 12 under the direction of Superintendent A. N. Lund.

Lake County Camp Being Moved

On the 8th of November it is planned to move the Lake County camp, known as Camp No. 11. This camp is located in the eastern part of Lake County and is engaged in the construction of the Tahoe-Ukiah highway, known as State Highway Route No. 15. Although a secondary route, this road receives federal aid. It is the main north state cross road, leaving the Auburn-Truckee road at a point near Cisco and after traversing almost the entire width of the state, connecting with the Redwood highway at Capella, a short distance north of Ukiah, Mendocino County. The new location of the Lake County camp will be at a point near the Stubbs Ranch, which borders on Clear Lake, its work being a continuation of the present project.

Progress Reports From the Field

/ / / / / / /

George W. Lane, who has been in charge of the Lake County camp, several months ago gave notice of his resignation, which is to take effect on November 15th. His position will be filled by E. D. Willitt, who recently had charge of construction work in the Tahoe region. F. W. Haselwood, District Engineer of District III, will supervise the work of Camp No. 11.

Camp E Located Near Mariposa

Camp E, under the supervision of District Engineer E. E. Wallace, District VI, headquarters, Fresno, is located ten miles east of Mariposa, working between El Portal and Mariposa. The camp is in charge of Superintendent W. B. Albertson and is now engaged in straightening the alignment of the all-year road into Yosemite Valley. Recently it was proposed to move Camp E to the Big Sur route, Carmel to San Simeon, in Monterey County, about January 1st, but the move has been postponed until early spring.

Camp Population

On November 1st, the population of the several camps was as follows:

Shasta Camp, No. 12-----	120 men
Lake Camp, No. 11-----	41 men
Mariposa Camp, E.-----	71 men
Total -----	232 men

Future Activities

According to a recent announcement made by B. B. Meek, Director of Public Works, 1928 will see a rapid expansion of the camp work. Several new camps will be established and at least 400 more men will be given the advantage of the outside work.

Aeroplane Used in Highway Location

The aeroplane has now come into use as a factor in highway location. On October 24th F. W. Haselwood, District Engineer for District III, left Sacramento in a Forest Service aeroplane to view the North Fork and the Middle Fork canyons of the Feather River from the sky. The plane was piloted by Captain Boggs. In three hours after leaving Sacramento, Mr. Haselwood was back in Sacramento. The plane flew at an approximate height of 5000 feet and at a speed of 90 miles an hour.

From Sacramento Mr. Haselwood and Captain Boggs flew direct to Oroville and from there to Bidwell Bar. The Middle Fork Canyon was then followed to Cromberg, where the plane turned, returning via Quincy, Spanish Creek and the North Fork to Oroville and Sacramento.

Mr. Haselwood states that a surprisingly accurate view of the country can be obtained in this manner, and that no difficulty was experienced in recognizing landmarks. A very excellent idea of the topography of the country was obtained.

STATE HIGHWAY PROGRESS REPORTS

Alameda County—Livermore to Dublin; N. M. Ball, contractor.

Contract covers construction of a 20 feet by 6 inches Portland cement concrete pavement constructed as a second story section over the old 15 feet by 4 inches existing concrete pavement. Also the construction of road borders and heavy grading work in filling bar pits and widening the existing roadway to conform with the standards of the department.

The concrete pavement has recently been completed and is now open to traffic. Contractor Ball is now at work in completing earth shoulders and rock borders near the Livermore end and it is expected the entire work will be completed before December 1st.

The contract immediately adjacent, Dublin to Hayward, Ariss-Knapp, contractors, is well under way. The heavy cuts at Bulmer and Castro Hills are nearing completion and much other grading under way. Water-bound macadam surface is being started, and while much of the work will necessarily be put over to spring, the newly graded sections will be ready for surfacing with quarry waste base course preparatory to final surfacing.

The work on the new bridges at Alamo, Tassajaro and Los Positas creeks, within the limits of the Ball contract, is now well under way. The Alamo Creek structure is all completed except pouring of concrete rails. The Tassajaro Creek is completed with the exception of concrete rails. The contractor is now

1928 Road Program in Preparation

at work on both of these structures. At the Los Positas Creek all form work is now in place for the superstructure and it is anticipated that the deck will be poured during the week of November 7th to 12th. Traffic is now being carried across the Alamo Creek; however, at the Tassajaro and Los Positas creeks detours are now in use and are surfaced with rock and oil for proper handling of traffic until bridges are completed.

Additional bridge work in the Dublin Canyon section of the Ariss-Knapp contract will soon be under way.

Contractor E. B. Shields will be awarded the contract covering construction of three bridges across Palomares, Hollis and Cull creeks between Dublin and Hayward.

It is hoped that the entire work on Route 5 between Livermore and Hayward will be completed by the late spring of 1928.

Alameda County is favored with still another contract which was recently awarded to the Allied Contractors, Inc., between Warm Springs Junction, Alameda County, and Milpitas, Santa Clara County.

The contract is to grade roadway, construct an 11 feet by 7 inches by 9 inches concrete strip on the right surface of the existing pavement with asphalt concrete and 12 feet by 4 inches rock border on both sides. The work is just starting.

No other work outside of general maintenance is under way in these counties.

Alpine County—State forces are replacing washed out central pier under the Centerville bridge located at the junction of routes 23 and 24, approximately 9 miles south of Markleeville.

State forces are repairing abutment on the Hangman's bridge. Such repairs are necessary because of damage to abutment due to scouring under foot of pier during high water.

One-half mile of line change on Carson spur is under way by state forces to improve alignment and grades.

Amador County—Plans and estimate are being prepared for the reconstruction of a bridge over Dry Creek to replace the present inadequate structure. Survey for this work was made by District X and the plans, estimate and construction will be handled by the Bridge Department.

1928 Road Program

In Preparation; Involves

\$23,500,000 Expenditure

A program for the construction of new sections of roads, to be paid for from the proceeds of the one-cent gasoline tax, is in process of preparation. This program will cover an expenditure of approximately \$7,500,000 during the calendar year of 1928. The rapidity of construction will be governed by the fact that the one-cent gasoline tax, imposed to defray the cost of new construction, is received in half yearly periods. The levy just made by the State Board of Equalization, which will yield \$1,500,000, now goes to the State Controller for collection, and will not be available for expenditure prior to December 1st. Another payment will be made in May.

In the meantime B. B. Meek, Director of the Department of Public Works, the Highway Commission, and R. M. Morton, Chief Highway Engineer, are working out the program of projects upon which this new construction gasoline tax money will be spent. This program is being arranged to accord with the periods at which the money is received.

It is planned that the new construction program will be instituted during the early spring months of 1928.

New construction financed by the one-cent construction gas tax bill, signed by Governor Young, together with reconstruction projects set forth in the budget submitted to the legislature by the Governor, passed by that body and approved by him, will bring the total highway expenditures for 1928 up to \$23,500,000.

This will be made up as follows:

Reconstruction projects included in state budget, together with maintenance payable out of state's share of the two-cent gasoline tax and motor vehicle fees	\$13,000,000
Federal aid repayments	3,000,000
New construction under one-cent gasoline tax	7,500,000

The present underpass underneath the Amador Central Railroad tracks between Ione and Jackson will in the near future be

replaced by a more adequate structure. The new work will consist of constructing two new timber bents on concrete footings supporting four 30-foot Bethlehem steel girders, on top of which the railroad track will be built. The new structure provides for a clear width of roadway between bents of 24 feet, which, together with the added sight distance, will make this stretch of road far more safe for the traveling public.

One mile of grading to widen roadbed and improve alignment and grade is under way by state forces on Silver Lake hill.

Colusa County—The twelve miles of rock borders which was recently awarded to Hemstreet and Bell between Williams and Delevan is under way and progress assures early completion.

Contra Costa County—The contract for grading and rocking the road between El Ciervo and Valona, Tieslau Bros., contractors, has been completed and accepted.

The approaches to the newly constructed Wild Cat Creek bridge are to be graded and rocked on the new alignment. This work will be advertised soon and constructed before the winter rains set in.

Four and one-half miles of 1½-inch asphaltic macadam surfacing of the existing concrete surface of the roadway between Crockett and Martinez is completed and open to traffic. Remainder skin coat under general maintenance.

At El Cerrito, Richmond, northerly 1.4 miles, the city of El Cerrito has just completed the surfacing of San Pablo avenue, which was done with the cooperation of the Department of Public Works, Division of Highways, which contributed \$35,000 to help defray the cost of same. This section was recently turned over to the city of El Cerrito for maintenance and jurisdiction.

El Dorado County—The Redmond-Nelson Company has just completed the construction of a combination dry and rubble masonry retaining wall facing Emerald Bay, which eliminates portion of the narrow highway facing this beautiful body of water, one of the most picturesque views in the state.

Hemstreet and Bell have just completed their crushed gravel contract.

Glenn County—A mile of bituminous macadam pavement which was recently awarded to C. K. Buchanan between Four Corners and Butte City is progressing nicely.

Inyo County—A number of stretches of the state highway between Lone Pine and

Bishop has been oiled. Four maintenance crews fully equipped are at work on the state highways in this county. The grading contract awarded F. C. Payton between Coso Junction and Olancha, a distance of 21 miles, is now under way. A bridge widening program for this county is planned.

Kern County (Easterly part of Kern County north of Mojave)—Two maintenance crews are at work in the easterly part of Kern County, north of Mojave. The work embraces the Kramer and Mojave road, a portion of the Bakersfield-Freeman road, and part of Route 23. The crews are equipped with tractors, motor graders and trucks. Recent rains have enabled these roads to be put into first-class condition.

Los Angeles County—The pouring of concrete for retaining walls, a flood protection measure, is now in progress on the Arroyo Seco road north of Pasadena in Los Angeles County.

Marin County—The surfacing of the existing highway from Ross to Larkspur (through Kentfield) is to be advertised soon. A 2 inches to 3½ inches asphaltic concrete surface 30 feet wide is to be constructed.

Mono County—Recent snow storms have compelled the disbandment of three maintenance crews. The rock crushing plant between Lone Pine and Independence has finished its season's run. The macadam work on a three mile stretch of road between Lone Pine and Independence has been completed. Four miles of road between these two points have been oiled. The widening of timber and concrete bridges from 16 to 24 feet is in progress.

Nevada County—Arthur Remter was recently awarded a contract for the construction of a truck and storage building and oil house at Nevada City maintenance site. He plans to commence operations on these buildings in the near future.

Orange County—Grading and culvert work is now well under way on the reconstruction of 5.7 miles of state highway in Orange County, between Galivan and Irvine.

Placer County—Hy Nelson was awarded a contract for the crushing and placing of crushed rock between Baxters and Shelter House Number 1. The recent rains have somewhat handicapped this work but it is thought the extension of open weather will permit the completion thereof before the snow drives the contractor out.

Sacramento County—Occasionally the Division of Highways expedites the awarding of a contract when the need is apparent, as was the case with the paving of approaches to the Ben Ali subway. Bids were opened on this work on October 31, signed by the Director of Public Works on November 2, the contractor was on the job November 3 and assures us that not later than the 7th the dirt will be flying. This means the elimination of a detour which has been in effect for some time due to the construction of the Ben Ali subway and will also allow the public to use this beautiful new structure and new safe alignment.

San Diego County—All work has been completed on the La Mesa to El Cajon reconstruction job in San Diego County. The new 20-foot concrete pavement with broad shoulders replaces a stretch of 15-foot pavement with numerous sharp curves.

At Del Mar in San Diego County grading has been completed, drainage structures are in place, and paving has been commenced on the change in the highway location which eliminates the present grade crossing and will carry the highway over the new overhead crossing of the Santa Fe tracks.

San Joaquin County—Survey, plans and estimate are under way for the construction of new trestle approaches to the New Hope Landing bridge. We expect to start on this work in the very near future.

Plans and estimate have been prepared for reconstruction of a portion of highway between French Camp and Mossdale. The construction of this unit will eliminate the present narrow and dangerous roadbed.

A contract for the grading and surfacing of that portion from Stockton northerly to Cherokee Station awarded to Irey and Holden, is at the present time under way. Rough grading is completed and the finished grading is now in progress. The total job is about 60 per cent complete.

San Mateo County—The bottle neck, Colma to Cypress Lawn Cemetery, is nearly broken. The grading and drainage contract of the Kaiser Paving Company is completed and the paving with cement contract two 30-foot strips, 9 inches to 11 inches thick, with some surfacing with asphaltic concrete over existing pavement, Hanrahan Company contract, is nearly complete.

The work will be completed about December 1st.

On the Bayshore highway, bids to resurface portions of the 4½-mile stretch between Visitation Valley and South San Francisco, Road

IV-SM-68-A, have been opened. The Federal Construction Company were low bidders. Work should start within ten days and be completed before Christmas.

The surfacing of the portion of the newly graded section between South San Francisco and Broadway Station, 5.2 miles, has been advertised for bids to be opened November 14th, and work should start before December 1st.

This work, consisting of rock surfacing and some structures, should carry on during the wet weather and be complete in time for the summer travel.

The neighboring section, Broadway Station to Fifth avenue, San Mateo, 3 miles, grading, drainage and rock surfacing, will be advertised shortly and carried on to completion to allow use about the time the previous section is completed, and will open up a wide roadway from San Francisco to San Mateo.

Sonoma County—The approaches to the newly constructed Sonoma Creek bridge are ready for advertising. The new alignment is to be graded and a rock surface constructed. This surface will be oiled.

Also the section of the Redwood highway from Ignacio to San Rafael is to be paved 20 feet 6 inches to 9 inches second story concrete; several changes made in alignment between Novato and Ignacio, these changes to be rocked and oiled. All structures are to be reconstructed to conform to standards. This work is being prepared for advertising and will come out soon.

Stanislaus County—Between Turlock and Modesto 4.7 miles of sandy shoulders are being treated with the oil mixing process, this work being done by state forces. The shoulders are to be treated for a width of three feet on each side of the pavement.

Plans and estimate are being prepared incidental to the construction of a new timber approach and earth fill approach replacing the present inadequate timber approach to the bridge across Stanislaus River.

Tuolumne County—Between Bakers Station and the summit of Sonora Pass, approximately 9.0 miles of widening roadway and improving alignment and grade is under way by state forces.

Four and one-half miles of rock surfacing on Bucks Meadows easterly is nearing completion. The material was crushed, hauled and placed under contract let to Montfort and Kassabaum. A portion of this work extends into Mariposa County.

(Continued on page 39.)

ONE DETOUR—*By* IRA L. WOOD, in *Arizona Highways*.

I am detour;
 Maker of cuss words,
 Producer of pains,
 Destroyer of autos.
 Even the good say damn when they see me
 And the wicked say I am hell.
 I putteth in action the rear seat drive,
 I maketh the Cadillac look like a flivver,
 And a flivver like a junk pile.
 Woe unto the motorist that forgetteth me;
 That taketh me not into consideration;
 That thinketh not of me when he planneth a journey!
 For, verily, when he is at the height of his pleasure,
 When he sayeth unto himself,
 "Verily this is the road of roads
 And motoring is the king of pleasure."
 Then will I descend upon him
 And utterly destroy his joy in life.
 Yea, verily, I will break his springs
 And bend his axle;
 I will burn out his bearings,
 And his differential I will turn into a scrap of metal;
 I will cause his tires to be punctured
 And his radiator to work like a sprinkler.
 Yea, verily, I will turn his whole trip into a nightmare
 For I am Detour, greatest of all joy killers.
 Even the high and mighty are humbled by me
 And the tourist liveth in fear of my wrath.

AND ANOTHER—*By* GEORGE C. MANSFIELD.

I am a California detour;
 A "sign of progress"
 The advance agent of better roads,
 Already in the building.
 The foolish may say damn
 When they ride over me,
 And the wicked may say hell.
 But the wise know that without me
 Good roads could not be,
 And they possess their soul in patience,
 Some even praising me.
 Chuck holes are my chuckles
 As I think of the privilege
 That has been mine
 To be the proud parent
 Of highways so fine
 That all the world sings
 Paeans of praise to these
 My road children.
 What if they forget
 My part in the work;
 Yet will I continue
 This first work to do.
 I clear the path
 That the way may be made straight,
 The pavement smooth,
 The roadbed firm,
 The highway good.
 If I bump the foolish,
 Besmattering the irritable,
 Stall the impatient,
 Why not?
 It may teach them to look
 Beneath the rough and outer surface,
 Down into the actuality of things.
 It may teach them to see mirrored in me
 The reflection of
 Labor and capital working peacefully together,
 Building a bigger state

For a better people.
 I am a California detour;
 A "sign of progress,"
 I apologize to no one,
 For without me
 Good roads could not be.

ROUGH GOING

"How's this?" asked the lawyer of the contractor.
 "You've named six material dealers in your will to be your pallbearers. Would you not rather choose some of your friends with whom you are on better terms?"

"No, Judge, that's all right. Those fellows have carried me so long that they might as well finish the job."

"One man is knocked down by an automobile every twenty minutes in Los Angeles."—*News Item*.

You would think it would wear him out.

—*Motor Chat*.

The following was the verdict by an Iowa jury in a suit against a railroad company:

"If the train had run as it should have run; if the bell had rung as it should have rung; if the whistle had blown as it should have blew, both of which it did neither—the cow would not have been injured when she was killed."—*Erith Observer*.

A farmer in the south came to town a few weeks ago with a load of cotton. "Do you know," he remarked as he stood near the newly improved highway, "I made the trip in a little under two hours this morning. It used to take me two days and a couple of plugs of chewing tobacco. This morning I made it with one chew."—*Building Materials*.

The track supervisor received the following note from one of his track foremen: "I'm sending in the accident report on Casey's foot when he struck it with the spike maul. Now under 'Remarks,' do you want mine or do you want Casey's?"

A balky mule has four-wheel brakes.

A billy goat has bumpers.

The firefly is a bright spotlight.

Rabbits are puddle jumpers.

Camels have balloon-tired feet.

And carry spares of what they eat;

But still I think that nothing beats

The kangaroos with rumble seats.

—*Kentucky Highways*.

In a certain province liable to floods there is a notice on a low-lying road which reads:

"When this sign is under water this road is impassable!"—*The Nation's Highways*.

Women, says an English paper, have invaded all but thirty-seven of the occupations of the world. There are as yet no women engine-drivers.

There isn't any back seat in a locomotive cab.

—*Judge*.

A man is something that can see a pretty ankle three blocks away while driving a motor car in a crowded city street, but will fail to notice, in the wide, open countryside the approach of a locomotive the size of a schoolhouse and accompanied by a flock of forty-two box cars.

THE CALF-PATH

One day, through the primeval wood,
A calf walked home, as good calves should;
But made a trail all bent askew,
A crooked trail as all calves do.
Since then two hundred years have fled,
And, I infer, the calf is dead.
But still he left behind his trail,
And thereby hangs my moral tale.
The trail was taken up next day
By a lone dog that passed that way;
And then a wise bell-wether sheep
Pursued the trail o'er vale and steep,
And drew the flock behind him, too,
As good bell-wethers always do.
And from that day, o'er hill and glade,
Through those old woods a path was made;
And many men wound in and out,
And dodged, and turned, and bent about
And uttered words of righteous wrath
Because 'twas such a crooked path.
But still they followed—do not laugh—
The first migrations of that calf,
And through this winding wood-way stalked,
Because he wobbled when he walked.
This forest path became a lane,
That bent, and turned, and turned again;
This crooked lane became a road,
Where many a poor horse with his load
Toiled on beneath the burning sun,
And traveled some three miles in one.
And thus a century and a half
They trod the footsteps of that calf.
The years passed on in swift fleet,
The road became a village street;
And this, before men were aware,
A city's crowded thoroughfare;
And soon the central street was this
Of a renowned metropolis;
And men two centuries and a half
Trod in the footsteps of that calf.
Each day a hundred thousand rout
Followed the zigzag calf about;
And o'er his crooked journey went
The traffic of a continent.
A hundred thousand men were led
By one calf near three centuries dead.
They followed still his crooked way,
And lost one hundred years a day;
For thus such reverence is lent
To well-established precedent.
A moral lesson this might teach,
Were I ordained and called to preach;
For men are prone to go it blind
Along the calf-paths of the mind,
And work away from sun to sun
To do what other men have done.
They follow in the beaten track,
And out and in, and forth and back,
And still their devious course pursue,
To keep the path that others do.
But how the wise old wood-gods laugh,
Who saw the first primeval calf!
Ah! many things this tale might teach,
But I am not ordained to preach.

—Sam Walter Foss.

U. S. MOTOR VEHICLE REGISTRATION

Motor vehicles registered in the United States in the first six months of 1927 totaled 20,991,333, according to a statement October 25 by the Bureau of Public Roads, Department of Agriculture. California's registration was 1,584,723 and was exceeded only by New York.

The increase in registration over 1926 amounts to 1,374,578 vehicles, or 7 per cent. California's increase was 8.6 per cent.

The full text of the statement follows:

A total of 20,991,333 motor vehicles were registered in the United States in the six months of 1927. This represents an increase of 1,374,578 or 7 per cent over the registration during the same period of last year.

The states showing the largest percentage increases are Tennessee, South Carolina, North Carolina, Illinois, West Virginia, New Jersey and Massachusetts. It is worth noting that 1926 statistics showed all of these states to be above the average of 5.4 persons per motor vehicle for the entire United States.

Revenue from registrations, licenses, etc., amounted to \$272,119,534, of which \$12,452,059 has been allocated for collection and administration purposes. \$188,525,679 for state highways, \$47,937,641 for local roads, \$21,795,330 for road bonds, and \$1,408,825 for miscellaneous purposes. In recent years the motor vehicle and gasoline tax revenues have constituted quite a substantial portion of highway expenditures.

The total motor vehicle registrations and the percentage of increase or decrease compared with the same period (six months) in 1926 were as follows:

Alabama	211,385	7.0
Arizona	69,599	8.5
Arkansas	175,709	—0.9
California	1,584,723	8.6
Colorado	234,794	4.0
Connecticut	262,035	9.8
Delaware	42,784	6.1
Florida	373,482	—0.6
Georgia	260,079	9.0
Idaho	89,006	5.8
Illinois	1,366,060	12.2
Indiana	745,000	7.9
Iowa	660,888	1.9
Kansas	454,685	4.9
Kentucky	254,595	3.0
Louisiana	210,000	—3.0
Maine	141,605	10.2
Maryland	249,883	9.8
Massachusetts	697,404	11.1
Michigan	1,041,482	5.0
Minnesota	607,725	5.8
Mississippi	197,881	9.9
Missouri	609,849	4.5

COMMUNICATED

Los Angeles Traffic Greater Per Mile Than Is That of Chicago

LOS ANGELES, CALIF., November 4, 1927.

MR. GEORGE C. MANSFIELD,

Editor CALIFORNIA HIGHWAYS,
Sacramento, Calif.

DEAR SIR:

A short article, "Cost of Road Traffic Delay," appears on page eight of the September issue of the CALIFORNIA HIGHWAYS.

The daily vehicle-miles in Cook County for 1924 are given as 990,000 for 418 miles of highway, or an average of 2390 per mile.

In Los Angeles County our traffic census shows 1,015,012 auto-miles and 105,159 motor truck miles per day for 158.55 miles of paved highways, or an average of 6400 and 663 per mile, respectively—a total of 7063, being more than three times the traffic in Cook County.

The computation of the cost of road traffic delay is a new feature and one which I can hardly recommend to represent true conditions. It is almost impossible to express loss of time, due to traffic conditions in money value.

This is entirely dependent on who is losing time and for what purposes people are traveling over the road. Pleasure travelers' time is certainly not worth three dollars an hour, nor is the time of the wife or children riding with the business man, though his time may be worth money. To compute this loss on the basis of accumulated time of four minutes per mile, gives the result far in excess of the actual value.

Loss of time in minutes can hardly be expressed in

Montana -----	91,701	—0.7
Nebraska -----	324,169	—1.7
Nevada -----	22,457	9.4
New Hampshire -----	86,618	9.7
New Jersey -----	639,339	11.1
New Mexico -----	50,556	8.6
New York -----	1,704,987	9.1
North Carolina* -----	418,271	12.6
North Dakota -----	145,383	0.9
Ohio -----	1,459,815	6.5
Oklahoma -----	459,429	4.2
Oregon -----	204,895	4.7
Pennsylvania -----	1,425,424	7.4
Rhode Island -----	103,533	7.1
South Carolina -----	174,378	15.5
South Dakota -----	152,069	—2.4
Tennessee -----	265,842	16.7
Texas -----	950,110	5.1
Utah -----	84,450	3.2
Vermont -----	69,058	9.8
Virginia -----	299,924	8.2
Washington -----	348,628	6.8
West Virginia -----	205,121	11.6
Wisconsin -----	626,452	6.0
Wyoming -----	46,198	4.1
District of Columbia -----	91,873	2.2
Total -----	20,991,333	7.0

* Registration figures for North Carolina cover full year.

money. In most cases the loss does not exceed a few minutes and can not amount to that number of hours.

The most important feature has been ignored—that is, no consideration has been given as to what the loss of time would have been if these 418 miles of highways had not been improved. I can not say how much time is gained and money saved on account of traffic moving more rapidly resulting from a paved road, but many years ago I originated the theory of operative income against the cost of maintenance and depreciation, by which I assumed that there is a difference of one cent per mile in favor of the paved highway due to less wear on tires, consumption of gasoline and loss of time, and at least five cents per ton-mile for motor trucks. I find that the 418 miles of paved highways in Cook County have produced an operative income of at least \$3,613,500 for the year of 1924 (the number of motor trucks were not mentioned), which gives an average of \$8,645 per mile.

On the same basis the 158.55 miles in Los Angeles County have shown an operative income of \$3,704,700 for the past year for automobiles and \$1,919,170 for motor trucks on the basis of truck-miles only and not ton-miles, making a total average operative income of \$55,471 per mile.

Looking at the matter from this standpoint, it is my opinion that we have given the improved highway due credit, as this represents indisputably the advantage to the public at large; in other words, it shows that money has actually been saved.

Very truly yours,

JOHN C. VEENHUYZEN.

(EDITOR'S NOTE.—Mr. Veenhuyzen is superintendent of the Division of Administration and Accounts of the Road Department of the county of Los Angeles.)

FEDERAL AID

The status of federal aid highway construction in the various states as of July 31, 1927, is contained in a report of the Bureau of Public Roads just received. The report for California follows:

Projects completed prior to July 1, 1927:

Total cost -----	\$35,128,269.04
Federal aid -----	16,967,026.82
Miles -----	1,306.3

Projects completed since June 30, 1927:

Total cost -----	\$384,361.20
Federal aid -----	224,871.31
Miles -----	15.9

Projects under construction (fiscal year 1928):

Estimated cost -----	\$7,088,452.73
Federal aid allotted -----	3,205,702.36
Miles -----	136.3

Projects approved for construction (fiscal year 1928):

Estimated cost -----	\$103,357.10
Federal aid allotted -----	62,114.26
Miles -----	4.5

Balance of federal aid fund available for new projects, \$4,096,637.25.

TREE PLANTING AND PUBLIC UTILITIES

(Continued from page 5.)

planted with roadside trees, the annual cost involved in their care and replacement representing an expenditure of two cents of each dollar appropriated for general maintenance work.

The highway right of way is also considered the natural location for utilities as service can be furnished with a minimum of extension lines and the cost of private right of way need not be added to the established rates.

The success of the tree planting movement, however, has placed a burden on the pole line companies, as the earlier plantings have reached sufficient height to interfere with wires and cause "cross-talk" on the telephone and electric disturbances on the power wires. To avoid topping or cutting unsightly notches through the trees, it is necessary either to raise the wires on longer poles or to move the lines. The public utility companies appreciate the value of the trees and generally where trimming has been permitted, the work is satisfactory. However, occasionally through carelessness, an unsightly job is done and the public's immediate protest indicates their active interest in roadside trees.

To minimize this conflict and satisfy both, from an aesthetic and economic view, at the same time provide for the future development of our highways, it was necessary to assign some definite location within the right of way to the trees, poles and service utilities. Placing trees too close to property lines has often resulted in damage to them from the stock within the adjacent fields. Proper cultivation and protection from fire is also hampered by too close proximity to property lines, and the cost of watering increases when trees are located beyond the reach of our one man tree watering units. Placing poles along the tree line means interference with proper tree growth and, due to continuous trimming for wire clearance, handicaps growth and development of the trees.

For these reasons it was decided to place the poles at the right of way line and the trees adjacent to the curb line. The trees at the future curb line will in time present a vista of green banked foliage restful to the eye of the motorist and to a large extent hiding the unsightly poles.

The location and maintenance of pole lines within the highway right of way and their interference with trees was recently the sub-

(Continued on page 39.)

BUILDING CALI- FORNIA'S BUILDINGS

(Continued from page 8.)

MISCELLANEOUS WORK

This subdivision includes all the activities of various sections of the division over and above those directly related to projects for which money has actually been appropriated.

Assistance of an advisory nature is constantly being rendered the various departments and institutions, in connection with technical subjects. Sketches and estimates are prepared for considerable proposed work that is never carried to completion. Development plans for the new institutions, and for proposed changes in the older ones, are constantly being worked on. Also plot plans showing existing conditions which the division has never been able to finance in a comprehensive way, and the lack of which represents a serious handicap, are being made as rapidly as possible and are being kept up to date to the best of our ability.

It is not possible to give an accurate account of the amount of time spent by the employees of the division on this miscellaneous work. It is safe to say, however, that as a minimum estimate one-third of the time of the executive officers and the section heads is devoted to the handling of these miscellaneous details.

Subcontracts are made in many cases rather than a general contract, where it can be demonstrated that a saving to the state can be effected in handling the work in this manner. When such a procedure is followed, the Division of Architecture acts in the same capacity as a general contractor. Construction work on the Sacramento state buildings is being carried on by the subcontract method.

Three specially important points in the present method of operation are called to attention as having much to do with the increasingly satisfactory results being obtained. These three points are as follows:

1. Projects are being carefully estimated by the Division of Architecture as to cost, in advance of making appropriations.

2. The state is gradually adopting a policy of permanent building construction at all institutions; there are only occasional exceptions to this in cases where particular conditions exist.

3. The Division of Architecture itself, is financed independently of the building appropriations; this almost entirely eliminates friction between the institutions and departments served and the division, and at the same time makes for greater efficiency in the division.

PERSONALIA



W. A. BECHTEL

At the fall board meeting of presidents, directors, secretaries and advisory boards of the Associated General Contractors of America, which took place in Birmingham, Alabama, October 17 to 20, 1927, Contractor W. A. Bechtel of San Francisco, a member of the Northern California Chapter, was unanimously nominated for the next president of the "A. G. C." Election will take place at the Annual Convention which will occur during the latter part of January, 1928, at West Baden, Indiana.

R. M. Morton, State Highway Engineer, has been honored by the American Association of State Highway Officials by selection as one of the ten members of its executive committee. The committee is made up of commissioners, engineers and others affiliated with highway construction in America.

Miss Lucile Steers, personnel clerk of District III, and Thornton K. May, draftsman in the headquarters Bridge Department, were married November 8th.

Miss Elizabeth Etzel, information clerk for a number of years in the headquarters office of the Highway Commission, and Mr. Wade Rowse, prominent farmer of Gridley, will be married in Reno on November 16th. They will make their home in Quincy, where Mr. Rowse is going into business for himself.

San Francisco can invest money to no better result than improvement of streets and creation of boulevards, making available to motorists its locations of beauty, believes Harvey M. Toy, former chairman of the State Highway Commission, who recently returned from a ten months' tour of the world. In Europe Toy found that country highways are far inferior to those of California, "but," he adds, "the big cities—Paris Vienna, and Berlin in particular—are far ahead of us in boulevard construction.

PUTTING THE "RIGHT"
INTO WATER RIGHTS

(Continued from page 7.)

such survey of water title, use of water, stream flow, etc., as may be necessary. Claims are filed, these are published, abstracted and appropriate notice given to interested parties and contests, if any, are heard. The division prepares its findings and submits them to the superior court which affirms or modifies and enters an order defining the rights of the respective parties.

DECREES ENTERED

Decrees have already been entered under one procedure or the other defining rights on Willow Creek in Lassen County, San Pedro Creek in San Mateo County, North Fork of Cottonwood, Hat and Burney creeks in Shasta County, West Fork of Carson River in Alpine County, Oak Creek in Inyo County and Morrison Creek in Del Norte County. Proceedings looking toward a determination of rights are under way or findings have been submitted and decrees are next in order on Stanislaus River, Shasta River, Whitewater River, North Cow, Oak Run and Clover creeks in Shasta County, Owl, Soldier and Emerson creeks in Modoc County, Butte Creek in Siskiyou County and Los Alamos Creek in Santa Barbara County.

WATER MASTERS

Section 37 of the Water Commission Act provides that the division "shall divide the state into water districts to be so constituted and adjusted as to insure the most practical and economical supervision of the distribution of water on the part of the state, and shall have authority to make such reasonable regulations to secure distribution of water in accordance with the determined rights as may be needed." There has so far been no comprehensive division of the state into water districts but the division has upon request of interested parties placed water masters upon Shasta River, North Fork of Cottonwood, Hat, Burney, North Cow, Oak Run, Clover, Butte, Owl, Soldier, Emerson and Cedar creeks—the waters of the last named creek being distributed under a decree of the superior court of Modoc County entered without reference to the division.

INVESTIGATIONS.

The investigational work of the division is often closely allied to the adjudication and stream administration work as might be

(Continued on page 39.)

THE "OIL MIX" METHOD

(Continued from page 13.)

harrow pulls in behind and begins mixing, going back and forth over the section oiled until the distributor returns with another tank load of oil. This harrowing operation can not be overdone.

The second and third oil applications are disc harrowed in the same manner as the first application.

The material is then bladed from the side to the center of the road with a road grader, the first trip with the grader lining up the edge in a straight line and throwing the material toward the center. A second trip with the grader flattens out toward the center the ridge thrown up by the first trip. The third trip windrows toward the center of the material flattened out by the second trip. Two adjacent windrows at the center are the result after the completion of the third trip on both sides of the road. The fourth trip with the grader lays one windrow on top of the other and the fifth trip splits this windrow in two, flattening out the material which is now on its way back to the edge of the road. The process is then repeated, usually with a ten-foot grader. Sometimes the mixing is done with a Best tractor pulling two graders with the blades set in opposite directions.

FINAL MIXING

The final mixing is entrusted to an experienced man who has learned by experience the proper color which must be obtained for best results. The amount of mixing and number of trips depends somewhat on the temperature, character of material being mixed and the viscosity of the oil. The process of mixing is continued until the rock is thoroughly coated with oil and until the entire mixture has attained a uniform brown color. The material is sometimes turned over from thirty to forty times.

A properly curved mold board set at approximately 45 degree angle and operated at a relatively high speed is essential for proper mixing. The tractors used for mixing are usually governed to operate in second gear at a speed of four miles per hour. This speed is essential in order to obtain a rolling action thus turning the material completely over on the face of the mold board instead of a sliding or crowding action.

After the material is thoroughly mixed, it is bladed to a uniform cross-section by the finish grader and maintained smooth under traffic by a light grader for several days. The

last grading should shape only the top one inch.

It is essential that an experienced and expert operator be used for the finish mixing and spreading. If not handled properly, the mixed material may be spread too thin in places and unnecessarily thick in others, particularly on super-elevated curves. Insufficient thickness results in early raveling of the surface which must be patched. When the surface ravel, the usual method of repair is to paint the surface of the resultant hole lightly with fuel oil and then fill the cavity with pre-mixed three-quarter-inch rock and oil tamped or rolled into place.

SUMMARY OF OPERATIONS.

Following is a summary of the different stages followed from beginning to end of a typical oil mix job:

1. Preliminary scarifying.
2. Balance grading.
3. Final scarifying.
4. First application of oil.
5. Disc harrowing.
6. Second application of oil.
7. Disc harrowing.
8. Third application of oil.
9. Disc harrowing.
10. Preliminary or rough blade mixing.
11. Final or finish blade mixing.
12. Spreading mix.
13. Surface compacting and smoothing.
14. Seal coat (if needed).
15. Correction of construction defects and maintenance.

AMOUNT OF OIL

The principles involved are similar to those governing asphaltic concrete excepting that the low viscosity asphaltic binder used in this process covers the particles with a thinner film than does the harder asphalt. Tests indicate that three-fourths as much light oil should be used as asphalt for like mixtures, though definite standards of quantity of oil have not been finally developed. Experienced operators can accurately judge requirements by appearance. A stain test modified from sheet asphalt practice promises to be useful. The amount of oil depends primarily upon the amount of sand and dust passing a 10-mesh screen.

Experience has demonstrated that the amount of oil to be used should be kept at a minimum.

In Oregon as low as from 0.9 per cent to 1.0 per cent of bitumen has been found holding a road. In California, the percentage

ranges from 2 per cent to 7 per cent with an average of 3 per cent to 4 per cent.

In order to secure best results, a screen analysis of the road material should be made prior to oiling.

Aggregate containing from 40 per cent to 60 per cent of 10-mesh material usually gives more satisfactory and stable results than aggregate containing less than 40 per cent passing a 10-mesh.

A hard nonporous gravel will usually require less oil and a porous volcanic rock a higher percentage.

In the final analysis the amount of oil used must be governed by the appearance and the mixing is continued until the material assumes a dark brown or chestnut color.

CORRECTION OF CONSTRUCTION DEFECTS AND MAINTENANCE

Construction defects are very apt to occur, especially when the work has been performed by a crew which has not had a great deal of experience. The defects consist of spots too rich or fat or which are too lean.

The spots which are too rich in oil may corrugate or rut. These places are easily rescarified and remixed. More dry material is brought up from below and mixed in until the proper color is secured.

This rescarifying and remixing of a too rich road is a job calling for much experience because of the fact that considerably less than one-half inch of additional dry material is usually sufficient to reduce the mix to the proper consistency.

If too lean a mix is secured either originally or after remixing it is customary to seal the surface with a light application of oil, approximating one-eighth gallon.

The reason why a smoother road on the average can and will be secured by the oil mix process than by the surface oiled method is primarily on account of the ability to smooth the surface of the oil mix road under traffic by means of the blade, a process which can not as a rule be used on surface oiled roads without danger of breaking the crust with resultant necessity of patching and consequent roughening of the surface, though this roughening may be slight when the patching is skillfully done.

COST

There is not a great deal of difference between the average cost of oiling by the penetration method and the cost by the oil mix

process, although the cost of specific projects by either method vary widely.

The average cost of oiling some 426 miles by the penetration method during the current year was \$1,103 per mile. The minimum cost was \$577 per mile on a six-mile section where only ten tons of screenings per mile were used for covering the oil. The maximum cost was \$1,582 per mile for oiling 125 miles in our District I where 0.66 gallons of oil per square yard and 252 tons of screenings per mile were used. An average of 0.585 of a gallon of oil per square yard was used on the total mileage oiled.

The average cost of oiling 185 miles by the oil mix process during the same period was \$1,183 per mile with an average use of 1.32 gallons of oil per square yard. The lowest cost was on a 2.3-mile section where \$761 per mile was spent. The most expensive work was in District VIII where the average cost was \$1,364 per mile, 1.6 gallons of oil being used per square yard. However, the work in District VIII is the best in the state and apparently fully justifies the additional expenditure to secure a first class job.

The average delivery price paid for over 7,600,000 gallons fuel oil used in California to date during 1927 has been \$1.78 per barrel, or \$0.04 per gallon. The price at the refinery was \$1.29 per barrel or 0.03 per gallon.

The 325,600 gallons of road oil used cost \$2.46 per barrel or 0.059 per gallon delivered.

CONCLUSION

In conclusion it may be repeated that no claim to originality is made in connection with the oiling of natural soil or crushed rock or gravel roads with light asphaltic oils.

It is claimed, however, that by following the methods of procedure outlined herein reasonable certainty can be had that roads so constructed on a good foundation will adequately serve even a large volume of traffic for a number of years at a much lower maintenance cost than the expense of maintaining and renewing a rock road with an untreated surface.

There is no doubt but that the uniform success which has attended the bulk of the oiling done in California this year is the result of systematic study and the adoption of uniform and proper methods of construction, accompanied by laboratory advice and control. Too much stress can not be laid upon the care which should be given any class of oiling work. Care and skill are necessary if satisfactory results are to be secured.

FROM OTHER STATES

ALABAMA is working toward a continuously improved highway running its entire length. This route, known locally as the Bee Line Highway, passes from Athens and Albany, on the north, through Birmingham, Montgomery, and on south to the Gulf.

ARIZONA—Arizona's greatest highway program, calling for the expenditure of \$5,654,487.52 for the construction and improvement of state highways, is provided for in the budget of the Arizona Highway Department for the remainder of the fiscal year ending June 30, 1928, was adopted September 10th by the Arizona State Highway Commission.

The revenue provided for in the budget is to be derived from the ten-mill property tax, direct appropriation, the four-cent gas tax, motor vehicle and motor title fees, proclamation and special appropriations. Federal Aid and municipal and railroad participation. Federal Aid participation for the present fiscal year aggregates \$2,367,581.62.

COLORADO'S state road program for 1927 called for an estimated expenditure of \$3,904,000, a major share of which was to be derived from the three-cent gasoline tax.

CONNECTICUT—The program of the state highway department for the next four years calls for the reconstruction of 137 miles of road in 1927, 362 miles in 1928, 585 miles in 1929 and 334 miles in 1930, and the construction of 550 miles of new highway. The estimated cost of this program is \$69,000,000.

LOUISIANA—A tour of inspection of the Louisiana flooded area, from Melville north and northwest to the Arkansas line, reveals the fact that truly remarkable progress has been made in rehabilitation work. The highway forces, under skillful direction, have almost completed the tremendous task of rebuilding and repairing the damage wrought by the unprecedented flood.

MINNESOTA—Northern and southern Minnesota, representing respectively the iron mining center of America and one of the richest farming regions, is now connected by a hard surfaced highway 355 miles long. Improvements were completed on the last remaining gaps a few weeks ago. Route No. 1 extends from the north shore of Lake Superior at Grand Marais, Minnesota, south via Duluth and the Twin Cities to the Iowa border.

NEW MEXICO has developed a low-cost ground-level road for the sparsely settled table lands. This type of construction, known as Mesa Roads, costs only \$300 a mile.

NEW YORK CITY has 700 pieces of motor driven equipment and 1500 trucks available for snow removal. Plans are being perfected for keeping the streets more completely cleared of snow and ice this coming winter than ever before.

OHIO—Approximately \$40,000,000 will become available for road construction and maintenance during the next year and a half. This will be applied to a state-wide program which includes many miles of reconditioning, rebuilding, relocating, widening, and otherwise grooming Ohio's roads for an estimated 1935 traffic of 2,600,000 vehicles serving 7,000,000 people.

PENNSYLVANIA—Patrols are maintained on practically the entire state primary and secondary system—comprising 11,456 miles—of which 4,546 miles

is hard surfaced, 3,245 miles of gravel or similar type, and 3,665 miles earth.

TEXAS—Texas highway road builders are experimenting with green coloring matter in their concrete material for the purpose of getting away from the glaring white of the ordinary concrete road. One objection to the green color is that the road at night would not be so visible.

WASHINGTON—What is believed to be the first magnetic device especially designed to serve in highway maintenance is reported by Professor H. B. Carpenter, Director of the Engineering Experiment Station, State College, Pullman, Washington. This equipment, designed by H. J. Dana of the Experiment Station, will pick up nails and heavier pieces of iron from a height of six inches or more. When lowered to within two inches of the ground it loosens and collects nails embedded in loose gravel or partly embedded in compacted material.

HIGHWAYS ARE CALIFORNIA'S ARTERIES, BUT WATER IS ITS LIFE BLOOD

(Continued from page 11.)

SPECIAL INVESTIGATIONS

Along with these many permanent statutory duties which continue through succeeding years, the State Engineer is enjoined by legislative enactments to make special engineering investigations, and serve on special state commissions and boards. An idea of the nature of these special investigations and the amount of work which they involve may be had by reference to the following investigations:

1. The Water Resources of California, which is the most comprehensive of its kind ever undertaken by any state, covering as it does a complete inventory of the waters of the state and providing for a comprehensive coordinated plan for their development.
2. The survey of the Santa Ana River watershed and basin, made in cooperation with Orange, Riverside and San Bernardino counties for the control of floods and for putting to beneficial use the waters of this area.
3. The investigation of the Salt Water Barrier and Iron Canyon Survey, made in cooperation with the United States Reclamation Service.

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There are people who believe that Florida will go Republican in the next presidential election.. Well, ice-fields have just been found in Africa.—American Lumberman.

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Before buying a horse you look in his mouth. Before buying a second-hand flivver look beside, behind and beneath the rear seat cushion. Should you find a couple dainty handkerchiefs and a pair of dice, or a lipstick and half a package of cigarettes, or several assorted buttons and a vanity case, or a cheap bracelet and an empty bottle, or perhaps a feminine garter, by all means, buy the car.

Regardless of what the dealer says, you have sufficient proof that the car has been run but little.

—College Humor.

October Record of Bids and Awards

HIGHWAYS

PLACER COUNTY—Road surfacing, crushed gravel or stone, between Baxter's and Shelter House No. 1, Dist. III, Rt. 37, Sec. D & E. Engineer's estimate \$13,750. Bids opened Oct. 3d as follows: J. R. Reeves, Sacramento, \$15,500; E. B. Bishop, Sacramento, \$15,500; Hy Nelson, Alameda, \$13,000; Hemstreet & Bell, Marysville, \$18,250; Tieslau Bros., Berkeley, \$16,000; J. F. Collins, Stockton, \$17,500. Contract awarded to Hy Nelson, \$13,000.

ORANGE COUNTY—Bridges, reinforced concrete girder, across Aliso Creek, and widening of existing reinforced concrete girder bridge 2 miles south of Tustin, Dist. VII, Rt. 2, Sec. B-C. Engineer's estimate \$23,154.50. The following bid was opened Oct. 10th: Richard R. Bishop, Long Beach, \$25,032.50. Bid rejected.

SAN BERNARDINO COUNTY—Three bridges over Warm Creek, Santa Ana River, and Mission Storm Drain; Dist. VIII, Rt. 26, Sec. A. Engineer's estimate \$81,639.40. Bids opened Oct. 10th as follows: Lynch, Cannon Engineering Co., Los Angeles, \$96,608.55; R. Johnson, Glendale, \$75,111.50; Martin Green, San Bernardino, \$79,695.60. Contract awarded to R. Johnson, Glendale, \$75,111.50.

COLUSA COUNTY—Two bridges over Stone Corral Creek and Funks Slough Bridge, Dist. III, Rt. 7, Sec. C. Engineer's estimate \$24,359.50. Bids opened Oct. 10th as follows: A. Young, Yreka, \$31,697.50; F. H. Neilson, Orland, \$26,157.50; M. A. Jenkins, Sacramento, \$23,933; Harry Thorsen, St. Helena, \$24,967; E. B. Skeels, Roseville, \$25,405; Holdener Construction Co., Sacramento, \$24,680.50; Noble Bros., San Jose, \$21,857.20; Villadsen Brothers, \$29,534.75. Contract awarded to Noble Brothers, San Jose, \$21,857.20.

SAN BERNARDINO COUNTY—Asphalt concrete paving, 9.3 miles between Cherry Avenue and San Bernardino, Dist. VIII, Rt. 9, Sec. A-B-C. Engineer's estimate \$225,984.50. Bids opened Oct. 10th as follows: Southwest Paving Co., Los Angeles, \$189,226.60; Ed. Johnson & Sons, Los Angeles, \$191,020.30; Allied Contractors, Inc., Omaha, Neb., \$193,383.20; Steele Finley, Santa Ana, \$182,544.50; A. Teichert & Son, Inc., Sacramento, \$207,730; Geo. R. Curtis Paving Co., Los Angeles, \$204,654; Hall-Johnson Co., Alhambra, \$184,977; Nighbert & Carnahan, Bakersfield, \$209,521.20; Geo. H. Oswald, Los Angeles, \$202,687; Griffith Co., Los Angeles, \$204,751.90. Contract awarded to Steele Finley, Santa Ana, \$182,544.50.

ALAMEDA COUNTY—Three reinforced concrete arch culverts, across Cull Creek, Palomares Creek, and Hollis Creek; Dist. IV, Rt. 5, Sec. B. Engineer's estimate \$63,185. Bids opened Oct. 24th as follows: Carl N. Swenson, San Jose, \$48,711.25; Noble Bros., San Jose, \$54,925.45; Atlas Construction Co., Inc., Oakland, \$58,870; Ariss-Knapp Co., Inc., Oakland, \$57,050; Villadsen Bros., Inc., San Francisco, \$42,972.85; Holdener Construction Co., Sacramento, \$55,358.75; L. J. Bristow Co., Santa Monica,

\$58,409.50; H. C. Whitty, Sanger, \$48,980.50; Otto Parlier, Tulare, \$49,275; M. B. McGowan, San Francisco, \$64,327.50; Mathews Construction Co., Sacramento, \$46,777.50; McDonald and Maggiora, San Francisco, \$46,322.50; George J. Ulrich Construction Co., Modesto, \$67,966.50; E. B. Skeels, Roseville, \$42,577.50; Johnson Construction Co., San Francisco, \$54,960.65; H. E. Macauley, San Francisco, \$45,608.50; Frederickson Bros., Stockton, \$52,658.50. Contract awarded to E. B. Skeels, Roseville, \$42,577.50.

SHASTA COUNTY—Reinforced concrete bridge across Pollards Gulch, about 2 miles north of La Moine; Dist. II, Rt. 3, Sec. D. Engineer's estimate \$54,656. Bids opened Oct. 24th as follows: McDonald & Maggiora, San Francisco, \$66,470; E. B. Skeels, Roseville, \$53,336.50; E. M. Bordwell, Napa, \$54,230; J. T. Logan, Grants Pass, Ore., \$68,360; A. Young, Yreka, \$59,527; and Holdener Construction Co., Sacramento, \$54,405. Contract awarded to E. B. Skeels, Roseville, \$53,336.50.

HUMBOLDT COUNTY—Reinforced concrete girder bridges across Prairie Creek, one-half mile north of Orick, and across Lost Man Creek, 3 miles north of Orick; Dist. I, Rt. 1, Sec. K. Engineer's estimate \$30,064. Bids opened Oct. 24th as follows: Fred J. Maurer & Son, Inc., Eureka, \$35,372.50; Smith Bros., Eureka, \$36,293.40; Mercer-Fraser Co., Eureka, \$34,122.50. Bids rejected, will be readvertised next spring.

MARIPOSA COUNTY—Laminated guard rail, about 1.25 miles between King Solomon Mine and Briceburg; Dist. VI, Rt. 18, Sec. E. Engineer's estimate \$7,475. Bids opened Oct. 24th as follows: B. C. Burnett, Turlock, \$6,825; N. L. Jones and E. R. Hibbard, Stockton, \$12,675 (irregular). Contract awarded to B. C. Burnett, Turlock, \$6,825.

SACRAMENTO COUNTY—Approaches at Ben Ali subway, 0.4 mile Portland cement concrete pavement; Dist. III, Rt. 3, Sec. B. Engineer's estimate \$20,078. Bids opened Oct. 31st as follows: C. W. Wood, Manteca, \$18,710; Frederickson-Watson Construction Company, Oakland, \$20,915.20. Contract awarded to C. W. Wood, Manteca, \$18,710.

IMPERIAL COUNTY—Repairing bridge across New River, near Seeley; Dist. VIII, Rt. 12, Sec. C. Engineer's estimate \$13,958. Bids opened Oct. 31st as follows: Norman B. Conway, Los Angeles, \$13,511; Pioneer Transfer Co., Inc., Calexico, \$15,964; Wheeler Company, Los Angeles, \$14,754; W. M. Ledbetter & Co., Los Angeles, \$12,999; L. Worrel, Alhambra, \$20,450; Greene Construction Co., Los Angeles, \$16,367. Contract awarded to L. M. Ledbetter & Co., Los Angeles, \$12,999.

ARCHITECTURE

CALIFORNIA POLYTECHNIC SCHOOL—General work, gymnasium and mechanical unit. Engineer's estimate \$53,990. Bids opened Oct. 4th as follows: Alfred L. Vezina, Santa Barbara, \$49,440; T. M. Maino, San Luis Obispo, \$51,690; Lamb & Bobick, Sacramento, \$52,800; Roy L. Rich-

ardson, Santa Barbara, \$53,502; W. J. Smith, San Luis Obispo, \$54,472; Carl N. Swenson, San Jose, \$54,889; Johnson Const. Co., San Francisco, \$55,859; R. S. K. McMillan, San Jose, \$59,869; Rudolph & Barr, Ventura, \$71,775. Contract awarded to Alfred L. Vezina, \$49,440.

CALIFORNIA POLYTECHNIC SCHOOL—Plumbing, heating and electrical work, for gymnasium and mechanical unit. Estimate \$10,961. Bids opened Oct. 4th as follows: Walter H. Smith, Long Beach, \$10,850; Luppen & Hawley, Sacramento, \$11,313; Latourrette-Fical Co., Sacramento, \$11,437. Contract awarded to Walter H. Smith, \$10,850.

STOCKTON ARMORY—Tile roofing work. Bids opened Oct. 6th as follows: W. L. Saxby, Oakland, \$2,818; R. E. Fraser Co., Stockton, \$2,850; Allyn Burr, Sacramento, \$2,388.80; San Joaquin Lumber Co., Stockton, \$3,024. Contract awarded Allyn Burr, \$2,388.80.

STATE LIBRARY AND COURTS BUILDING—Furnishings, and technical equipment. Bids opened Oct. 7th as follows: Purnell Stationery Co., Sacramento, \$80,475.41; McKee & Wentworth, San Francisco, \$84,984.50; Gardner, Ehman & Kohler, Sacramento, \$3,318; H. S. Crocker Co., Sacramento, \$10,920.89; alternate bid, \$6,016.75. Award pending.

STOCKTON STATE HOSPITAL—General work, cottages 5, 6 and 7. Engineer's estimate \$171,970. Bids opened Oct. 18, 1927, as follows: John E. Branagh, Oakland, \$153,000; H. E. Vickroy, Stockton, \$156,000; John J. Cavanaugh, Stockton, \$157,643; Johnson Construction Company, San Francisco, \$158,490; F. R. Zinck, Stockton, \$158,777; Peter Sorensen, San Francisco, \$161,483; Tucker & Riley, Stockton, \$163,839; F. H. Betz, Sacramento, \$163,946; J. F. Shepherd, Stockton, \$165,825; Carl N. Swensen, San Jose, \$166,987; J. H. Carpenter, Stockton, \$171,500; J. A. Bryant, San Francisco, \$171,860; J. S. Hannah, San Francisco, \$174,972; C. L. Wold, San Francisco, \$178,500; F. L. Hansen, San Francisco, \$184,600; and William Martin, San Francisco, \$191,667. Contract awarded to John E. Branagh, Oakland, \$153,000.

STOCKTON STATE HOSPITAL—Electrical work, farm cottages 5, 6 and 7. Engineer's estimate \$5,150. Bids opened Oct. 18th as follows: Hild Elec. Mfg. Co., Stockton, \$3,585; E. H. Grogan, Stockton, \$4,166; E. L. Gnekow, Stockton, \$4,279; Latourrette-Fical Co., Sacramento, \$4,425; Luppen & Hawley, Sacramento, \$5,555; and Scott Plumbing and Elec. Co., Sacramento, \$7,637. Contract awarded to Hild Electrical Mfg. Co., Stockton, \$3,585.

STOCKTON STATE HOSPITAL—Plumbing and heating work, farm cottages 5, 6 and 7. Engineer's estimate \$22,594. Bids opened Oct. 18th as follows: W. H. Picard, Oakland, \$21,105; E. L. Gnekow, Stockton, \$23,561; Hatley & Hatley, Sacramento, \$23,588; Scott Plumbing & Elec. Co., Sacramento, \$23,615; E. H. Grogan, Stockton, \$23,941; Luppen & Hawley, Sacramento, \$24,240; Brandt Bros., Stockton, \$24,500; Latourrette-Fical Co., Sacramento, \$25,095; and R. M. Wilson, San Francisco, \$27,662. Contract awarded to W. H. Picard, Oakland, \$21,105.

STOCKTON STATE HOSPITAL—Plumbing, heating and electrical work for farm cottages 5, 6 and 7. Engineer's estimate \$27,744. Bids opened Oct. 18th as follows: E. L. Gnekow Co., Stockton, \$27,546; E. H. Grogan Company, Stockton, \$28,000; Latourrette-Fical Co., Sacramento, \$29,420; Luppen & Hawley, Sacramento, \$29,421; and Hyman Rosenberg, San Francisco, \$30,200. Award pending.

EDUCATIONAL BUILDING, AGRICULTURAL PARK, SACRAMENTO—Composition roof and repair

work. Engineer's estimate \$1,410. Bids opened Oct. 21st as follows: Capital Roofing & Supply Company, Sacramento, \$1,045; State Roofing Company, Sacramento, \$1,062; Leitch Roofing Co., Sacramento, \$1,898; and Larson Company, Sacramento, \$2,120. Contract awarded to Capital Roofing & Supply Company, Sacramento, \$1,045.

VENTURA SCHOOL FOR GIRLS—Laundry. Engineer's estimate \$9,018. Bids opened Oct. 25th as follows: Johnson Construction Co., San Francisco, \$8,567; Johnson & Hansen, Ventura, \$9,837; Roy L. Richardson, Santa Barbara, \$10,139; J. W. Jean Co., Pasadena, \$10,252; Alfred L. Vezina, Santa Barbara, \$10,440; G. E. Penn, Ventura, \$11,767; Louis A. Geisler, Huntington Park, \$13,200; Jack W. Baker, Ventura, \$13,836. Award to Johnson Construction Company.

SONOMA STATE HOME—Pasteurizer and cooling equipment. Engineer's estimate \$2,343. Bids opened Oct. 25th as follows: Creamery Package Mfg. Co., San Francisco, \$2,547; Cyclops Iron Works, San Francisco, \$2,550; York Products Corporation, \$3,111; and Frank H. Raffo, San Francisco, \$3,175. Contract awarded to Creamery Package Mfg. Co., San Francisco, \$2,547.

SAN QUENTIN—Miscellaneous iron and steel work. Engineer's estimate \$37,795. Bids opened Oct. 26th as follows: Palm Iron Works, Sacramento, \$34,800; Fair Mfg. Co., San Francisco, \$34,898; Folsom Street Iron Works, San Francisco, \$34,617; Golden Gate Iron Works, San Francisco, \$39,256; Pacific Rolling Mill Co., San Francisco, \$39,500; McClintic-Marshall Co., Los Angeles, \$39,695; Sims & Gray Iron Works, San Francisco, \$43,700; Schrader Iron Works, San Francisco, \$48,990; and Calif. Steel Products Co., San Francisco, \$49,845. Award pending.

PATTON STATE HOSPITAL—Installation of 350-h.p. boiler. Bids opened Oct. 27th as follows: R. G. Meyler, Los Angeles, \$17,300. Alternates: (1) \$1,200; (2) \$580; (3) \$100; (4) \$570; (5) \$30; (6) \$700. C. C. Moore, San Francisco, \$20,003. Alternates: (1) \$1,118; (2) \$323; (3) \$600; (4) \$862; (5) \$189; (6) \$898. Llewellyn Iron Works, Los Angeles, \$20,429. Alternates: (1) \$1,800; (2) \$700; (3) ----; (4) \$560; (5a) \$400; (5b) \$700; (6) \$600; (7) \$500. Award pending.

State Highway Authorizations

The following authorizations were made by vote of the California Highway Commission at a meeting held in Fresno, October 20th:

Director of Public Works authorized to prepare plans and specifications for construction of approximately 21 miles of water pipe line through the Rindge Ranch (Dist. VII LA-60-A) at an estimated cost of \$50,000 from the State Highway Construction Fund; said pipe line to be used in construction and maintenance of the state highway.

Allotment of \$10,000 authorized from the Third State Highway Fund to provide for cost of engineering and inspection in connection with construction work payable from the Third State Highway Fund, and for which engineering and construction no allotment

has hitherto been provided, and which, in the discretion of the Director of Public Works, it may be necessary for him to expend.

Routes adopted:

Del Norte County: Southerly boundary to Richardson Creek (Dist. I DN-1-A).

Sonoma County: One mile west of Sonoma Creek to Sonoma Creek (Dist. IV Son-8-A); Sonoma Creek to Schellville (Dist. IV Son-8-B).

Sacramento County: One mile south of Arno to McConnell (Dist. X Sac-4-A).

WATER PERMITS AND APPLICATIONS

Permits to appropriate water issued by the Department of Public Works, Division of Water Rights during the month of October, 1927.

MODOC COUNTY—Permit 2901, Application 5385; issued to Emil Enquist and Geo. Wernmark, Davis Creek, October 5, 1927, for 400 acre-feet per annum from two unnamed ravines in sections 13 and 24, T. 47 N., R. 12 E., for irrigation of 236 acres near point of diversion. Estimated cost \$2,400.

SAN BERNARDINO COUNTY—Permit 2902, Application 5344; issued to E. W. Cook, Los Angeles, October 5, 1927, for 200 gallons per day from two unnamed springs in section 22, T. 2 N., R. 1 W., for domestic use in section 22. Estimated cost \$1,000.

NEVADA COUNTY—Permit 2903, Application 5594; issued to R. M. Ewing and A. J. Edminster, Nevada City, October 6, 1927, for 3 cubic feet per second from Middle Fork of Greenhorn Creek in section 3, T. 16 N., R. 10 E., for power and domestic purposes in section 3. 75 t.h.p. to be developed. Estimated cost \$1,000.

MADERA COUNTY—Permit 2904, Application 5655; issued to Claude E. Williams, Bass Lake, October 27, 1927, for 1.5 cubic feet per second from North Fork Willow Creek in section 9, T. 7 S., R. 22 E., M. D. M., for power purposes in NW $\frac{1}{4}$ of SE $\frac{1}{4}$ of said section 9.

EL DORADO COUNTY—Permit 2905, Application 5601; issued to Edward Ogden Strong and W. E. Bristol, Sacramento, October 27, 1927, for 0.002 cubic foot per second from unnamed spring in section 26, T. 11 N., R. 15 E., for domestic purposes. Estimated cost \$100.

SAN DIEGO COUNTY—Permit 2906, Application 5608; issued to Arthur M. and Fannie I. Neal, San Diego, October 27, 1927, for 0.025 cubic foot per second from unnamed springs in section 20, T. 13 S., R. 1 W., S. B. M., for domestic use in section 20. Estimated cost \$1,000.

NEVADA COUNTY—Permit 2907, Application 5695; issued to Miss M. Philomene Hagan, 2034 Ellis street, San Francisco, October 27, 1927, for 0.005 cubic foot per second from unnamed spring in section 16, T. 17 N., R. 13 E., for domestic purposes. Estimated cost \$250.

SAN BERNARDINO COUNTY—Permit 2908, Application 5285; issued to D. C. Hammell, 123 S.

Broadway, Los Angeles, October 29, 1927, for 0.001 cubic foot per second from underground water in section 22, T. 2 N., R. 1 W., for domestic use. Estimated cost \$400.

Applications for permit to appropriate water filed with the State Department of Public Works, Division of Water Rights, during the month of October, 1927.

TRINITY COUNTY—Application 5707; James T. Whittlesey, room 457, City Hall, San Francisco, for 15 cubic feet per second from Price Creek tributary to Trinity River. To be diverted in section 5, T. 33 N., R. 12 W., M. D. M., for hydraulic mining purposes. Estimated cost \$500.

VENTURA COUNTY—Application 5708; F. P. Hulburt, 1616 Fifth avenue, Los Angeles, for 0.25 cubic foot per second from Little Sycamore Canyon tributary to Pacific Ocean. To be diverted in section 14, T. 1 S., R. 20 W., S. B. M., for irrigation and domestic purposes on 30 acres. Estimated cost \$1,000.

SAN BERNARDINO COUNTY—Application 5709; H. B. Martin, 303 Story Building, Los Angeles, c/o Geo. F. Moser, P. O. Box 406, Oatman, Arizona, for 1.00 cubic foot per second from unnamed spring. To be diverted in section 28, T. 8 N., R. 18 E., S. B. M., for mining purposes. Estimated cost \$500.

PLUMAS COUNTY—Application 5710; Gus Berg, Rich, Plumas County, California, for 0.025 cubic foot per second from unnamed spring tributary to East Fork North Fork Feather River. To be diverted in section 21, T. 25 N., R. 7 E., M. D. M., for mining and domestic purposes. Estimated cost \$300.

SAN BERNARDINO COUNTY—Application 5711; Paul F. Myers et al., Box 306, La Verne, for 0.01 cubic foot per second from unnamed spring tributary to Big Bear Lake. To be diverted in section 14, T. 2 N., R. 1 W., S. B. M., for domestic purposes. Estimated cost \$100.

SAN JOAQUIN COUNTY—Application 5712; Richard and Nellie C. Stevens, Route A, Box 140, Ripon, for 1.25 cubic feet per second from Lone Tree Creek tributary to San Joaquin River. To be diverted in section 24, T. 1 S., R. 7 E., M. D. M., for irrigation purposes on 100 acres. Estimated cost \$1,000.

SAN BERNARDINO COUNTY—Application 5713; Chas. A. Boynton, Victorville, for 1.00 cubic foot per second from unnamed spring. To be diverted in section 12, T. 3 N., R. 1 W., S. B. M., for agriculture, domestic and stock purposes on 80 acres. Estimated cost \$700.

TRINITY COUNTY—Application 5714; Wm. H. Gray, Salyer, Trinity County, for (1) 0.05+ cubic foot per second, (2) 0.08+ cubic foot per second, (3) 0.37+ cubic foot per second from (1) spring, (2) gulch, (3) Grays Creek. To be diverted in sections 34 and 28, T. 6 N., R. 6 E., H. M., for irrigation and domestic purposes on 40 acres.

SIERRA COUNTY—Application 5715; T. L. Park, c/o California Buttes Mining Co., Sierra City, for 5.00 cubic feet per second from (1) Big Spring, (2) Sardine Creek tributary to Yuba River. To be diverted in section 15, T. 20 N., R. 12 E., M. D. M., for power purposes. Estimated cost \$10,000.

PLUMAS COUNTY—Application 5716; La Porte Mines, Inc., c/o J. N. Turner, attorney, La Porte, for 15.00 cubic feet per second from South Fork Feather River tributary to Feather River. To be diverted in section 13, T. 22 N., R. 9 E., M. D. M., for mining purposes. Estimated cost \$2,000.

PLUMAS COUNTY—Application 5717; La Porte Mines, Inc., c/o J. N. Turner, attorney, La Porte, for 15.00 cubic feet per second from South Fork Feather River tributary to Feather River. To be diverted in section 13, T. 22 N., R. 9 E., M. D. M., for power purposes. Estimated cost \$2,000.

SAN JOAQUIN COUNTY—Application 5718; Western Pacific Railroad Company, Engineering Department, Mills Bldg., San Francisco, for 0.023 cubic foot per second from Potato Slough tributary to South Fork Mokelumne River. To be diverted in section 13, T. 3 N., R. 4 E., M. D. M., for domestic purposes.

NEVADA COUNTY—Application 5719; W. H. Griffith et al., c/o W. H. Griffith, Oakland, for 2.00 cubic feet per second from Rock Creek tributary to South Fork Yuba River. To be diverted in section 25, T. 17 N., R. 8 E., M. D. M., for fish culture and recreational purposes.

SAN MATEO COUNTY—Application 5720; Harriet N. Diamond, c/o Cyril Williams, Jr., 369 Pine street, San Francisco, for 0.006+ cubic foot per second from unnamed stream tributary to La Honda Creek. To be diverted in section 35, T. 6 S., R. 4 W., M. D. M., for domestic purposes. Estimated cost \$2,000.

TUOLUMNE COUNTY—Application 5721; Emil Schwoerer et al., c/o Emil Schwoerer, Vallejo, for 0.10 cubic foot per second from unnamed spring tributary to Spaulding Creek. To be diverted in section 8, T. 3 N., R. 15 E., M. D. M., for mining and domestic purposes.

SAN BERNARDINO COUNTY—Application 5722; Mrs. Goldie Stevens, Box 204, Reseda, for 0.001 cubic foot per second from unnamed spring tributary to Big Bear Lake drainage area. To be diverted in section 14, T. 2 N., R. 1 W., S. B. M., for domestic purposes. Estimated cost \$100.

SAN DIEGO COUNTY—Application 5723; Cyris M. Ewing, Vista, San Diego County, for 0.50 cubic foot per second from well. To be diverted in section 12, T. 11 S., R. 4 W., S. B. M., for irrigation and domestic purposes. Estimated cost \$600.

MERCED COUNTY—Application 5724; Lucas Kilkenny, 315 Chauncey Bldg., 564 Market street, San Francisco, for 340 cubic feet per second from (1) Deadman Creek, (2) Duck Creek, (3) Owens Creek, (4) Bear Creek, tributary to San Joaquin River. To be diverted in sections 30 and 19, T. 8 S., R. 12 E., and section 12, T. 8 S., R. 11 E., M. D. M., for irrigation purposes on 2070.87 acres. Estimated cost \$100,000.

MERCED COUNTY—Application 5725; Lucas E. Kilkenny, 317 Chauncey Bldg., 564 Market street, San Francisco, for 50 cubic feet per second from Baldwin Slough tributary to San Joaquin River. To be diverted in section 28, T. 6 S., R. 9 E., M. D. M., for irrigation purposes on 1480.84 acres. Estimated cost \$10,000.

TUOLUMNE COUNTY—Application 5726; Mrs. C. J. Albert, Groveland, Tuolumne County, for 0.025 cubic foot per second from unnamed spring tributary to Big Creek. To be diverted in section 6, T. 2 S., R. 17 E., M. D. M., for irrigation and domestic purposes on 25 acres.

LOS ANGELES COUNTY—Application 5727; B. F. Burkhardt and Anna M. Burkhardt, Little Rock, for 750 acre-feet per annum from Middle Fork Palmett Creek tributary to Big Rock Creek. To be diverted in section 23, T. 4 N., R. 10 W., S. B. M., for irrigation and domestic purposes on 300 acres.

SAN BERNARDINO COUNTY—Application 5728; Dewitt Blair Realty Co., c/o Chas. L. Foulke, 455 Fourth street, San Bernardino, for 0.08 cubic foot per second from a spring tributary to Mojave River. To be diverted in section 23, T. 2 N., R. 2 W., S. B. M., for domestic purposes for 500 residences. Estimated cost \$800.

MENDOCINO COUNTY—Application 5729; John M. McGregor, 701 Taylor street, San Francisco, for 1.00 cubic foot per second from One Eye Creek tributary to Berger Creek. To be diverted in section 34, T. 22 N., R. 14 W., M. D. M., for irrigation and domestic purposes on 80 acres.

LOS ANGELES COUNTY—Application 5730; William L. Wolfskill, 227 South Union avenue, Los Angeles, for 0.25 cubic foot per second from Rogers Creek tributary to San Gabriel River. To be diverted in section 14, T. 1 N., R. 10 W., S. B. M., for agricultural and domestic purposes on 20 acres.

SAN BERNARDINO COUNTY—Application 5731; U. S. Forest Service, San Bernardino, for 0.036 cubic foot per second from three unnamed springs tributary to Santa Ana River. To be diverted in section 20, T. 1 N., R. 1 E., S. B. M., for domestic purposes. Estimated cost \$1,000.

LOS ANGELES COUNTY—Application 5732; U. S. Forest Service, c/o Forest Supervisor, 629 Federal Bldg., Los Angeles, for 0.25 cubic foot per second from Bouquet Canyon tributary to Santa Clara River. To be diverted in section 31, T. 6 N., R. 14 W., S. B. M., for domestic purposes. Estimated cost \$2,500.

KERN COUNTY—Application 5733; Harvey M. Cuff, Sandberg, for 1.00 cubic foot per second from spring. To be diverted in section 30, T. 10 N., R. 16 W., S. B. M., for irrigation and domestic purposes on 20 acres. Estimated cost \$4,500.

BUTTE COUNTY—Application 5734; Wm. Hayes, Merrimac, for 0.60 cubic foot per second from Little Ram Creek tributary to French Creek. To be diverted in section 32, T. 22 N., R. 6 E., M. D. M., for mining and domestic purposes. Estimated cost \$200.

BUTTE COUNTY—Application 5735; A. Moll, c/o Winchester Hotel, 44 Fourth street, San Francisco, for 0.025 cubic foot per second from Little Ram Creek tributary to French Creek. To be diverted in section 32, T. 22 N., R. 6 E., M. D. M., for irrigation and domestic purposes on two acres. Estimated cost \$200.

EL DORADO COUNTY—Application 5736; Dr. Leroy Francis Herrick, 542 Lakeside Blvd., Oakland, for 1.50 cubic feet per second from three unnamed springs tributary to Lake Tahoe via unnamed gulch. To be diverted in section 31, T. 14 N., R. 17 E., M. D. M., for power purposes. Seventeen theoretical horsepower to be developed. Estimated cost \$4,000.

EL DORADO COUNTY—Application 5737; Young Men's Christian Association, c/o J. W. Gross, Forum Bldg., Sacramento, for 1.00 cubic foot per second from Branch of Bryant Creek tributary to American River. To be diverted in section 15, T. 11 N., R. 17 E., M. D. M., for domestic and fire protection purposes. Estimated cost \$3,000.

SAN DIEGO COUNTY—Application 5738; Helen K. Brininger, 3940 Huron Ave., Culver City, for 0.50 cubic foot per second and 2.5 acre-feet per annum from Palm Creek tributary to Coyote Creek. To be diverted in section 22, T. 10 S., R. 5 E., S. B. M., for irrigation and domestic purposes on 40 acres. Estimated cost \$1,250.

SAN DIEGO COUNTY—Application 5739; Fred L. Cornish, 1493 Stearns drive, Los Angeles, for 2.00 cubic feet per second and 15 acre-feet per annum from Palm Canyon tributary to Coyote Creek. To be diverted in section 22, T. 10 S., R. 5 E., S. B. M., for irrigation and domestic purposes on 164.43 acres. Estimated cost \$5,000.

SAN DIEGO COUNTY—Application 5740; Leta Cornish, 1493 Stearns drive, Los Angeles, for 1.00 cubic foot per second and 5 acre-feet per annum from Palm Canyon tributary to Coyote Creek. To be diverted in section 22, T. 10 S., R. 5 E., S. B. M., for irrigation and domestic purposes on 80 acres. Estimated cost \$2,500.

DEL NORTE COUNTY—Application 5741; R. W. Pepin, c/o Allen & Roberts, Portland, Oregon, for 50 cubic feet per second from Jones Creek tributary to South Fork Smith River. To be diverted in section 27, T. 16 N., R. 3 E., H. M., for mining purposes. Estimated cost \$30,000.

MONO COUNTY—Application 5742; Frank G. English, Box 73, Laws, for 1.00 cubic foot per second from Sacramento Canyon. To be diverted in section 11, T. 5 S., R. 33 E., M. D. M., for agricultural purposes. Estimated cost \$1,200.

TREE PLANTING AND PUBLIC UTILITIES

(Continued from page 30.)

ject of a thorough discussion before the Highway Commission and the Director of the Department of Public Works by a committee representing practically all of the public utility companies of the state. The conclusion reached substantiated the policies of the Maintenance Department.

The drawings shown represent the proposed ultimate sections for two- and four-way traffic lanes for eighty-foot width of right of way. In effect, they reserve on an eighty-foot right of way a clear zone of 56 feet between curbs for road purposes, the remaining space being available for trees, pole lines and sidewalks for pedestrians.

STATE HIGHWAY PROGRESS REPORTS

(Continued from page 26.)

Ventura County—With the exception of the placing of some heavy riprap rock, all work has been completed on the reconstruction of the Coast highway from Ventura westerly to a point near the Santa Barbara County line.

Yolo County—State forces are doing work incidental to remedying the drainage conditions at the West Sacramento subway underneath the Sacramento Northern Railroad tracks.

PUTTING THE "RIGHT" INTO WATER RIGHTS

(Continued from page 31.)

expected, but investigations are sometimes carried on in connection with proceedings related to supervision over the initiation of rights to appropriate. In addition to the investigations conducted in connection with each proceeding for the determination of rights the division has conducted or is conducting the following rather comprehensive investigations—the Niles Cone, the Kings River, the Kern River, the Inyokern, the San Joaquin Hydrographic, the San Joaquin Valley Underground Water, the San Joaquin-Sacramento Delta Salinity, the San Jacinto, the Lopez Creek, the Return Water, the San Dimas, the San Gabriel, the Ventura County Hydrographic and the Sacramento-San Joaquin Water Supervisor investigations.

HISTORY OF DIVISION

The powers and duties of the Division of Water Rights, Department of Public Works of the State of California, are set forth in what is known as the Water Commission Act. This act was passed by the legislature and approved by the Governor on June 16, 1913. It was made the subject of a referendum vote and affirmed by vote of the people on November 3, 1914, going into effect on December 19, 1914. The act in its original form created a water commission of five members, whence the name Water Commission Act. The commission was, however, abolished in 1921 and its powers and duties were transferred to the Division of Water Rights of the Department of Public Works when that department was created in 1921.

REPORTS

The history of its work is more specifically set forth in the several biennial reports of the division and the results of its investigations have been published in the biennial reports, Bulletins 1 to 5, inclusive, and numerous typed or mimeographed reports which can be made available to interested parties.

"My town is the place where my home is founded; where my business is situated; where my vote is cast; where my children are educated; where my neighbors dwell and where my life is chiefly lived. It is the home spot for me. My town has the right to my civic loyalty. It supports me, and I must support it. My town wants my citizenship, not partisanship; friendliness, not offensiveness; cooperation, not dissension; sympathy, not criticism; my intelligence, not indifference. My town supplies me with law and order, trade, friends, education, morals, recreation and the rights of a freeborn American. I should believe in my town and work for it."—Selected.

HIGHWAY RESEARCH

Public Roads, the journal of highway research of the Bureau of Public Roads of the U. S. Department of Agriculture, in its last issue contains articles dealing with the following subjects:

Protection of Concrete Against Alkali, Static and Impact Loads Transmitted to Culverts,

Effect of Quality of Portland Cement Upon the Strength of Concrete,

Capping Square for Concrete Compressive Strength Specimens.

New Research Projects Initiated by Bureau of Public Roads.

On the first subject the "Protection of Concrete Against Alkali" general conclusions are given as follows:

1. That water-gas tar of the proper quality is readily absorbed by cement mortar and concrete, the rate of absorption varying with the manner of curing, age and density of the mix. Concrete of a 1:3:6 mix cured, respectively, 48 hours and 7 days under moist conditions in the forms followed by 7 days' exposure to dry air, was found to be the most absorptive, while a 1:1½:3 mix, cured 7 days in forms and 83 days in air, was the least absorptive.

2. That the absorption of coal tar by concrete is similar to that of water-gas tar except that the quantity absorbed increases with the time of exposure after treatment with water-gas tar.

3. That a treatment consisting of 4 coats of water-gas tar applied at the rate of about one-fourth gallon per square yard of surface, followed by one coat of coal tar appears to afford adequate protection against alkali attack, provided the concrete is of good quality, has been properly fabricated and not leaner than a 1:2:4 mix.

The Highway Engineer's Creed

I believe that transportation is the keystone of the structure of civilization which is built of school, and church, and court, and market place upon the twin foundations of the home and productive industry.

I believe that highway transportation is a necessary and integral part of this connecting stone in civilization's arch and is coequal with other forms of transportation in sustaining the body of the structure.

I believe that my mission, as a highway engineer, is to assist in shaping and improving the highways of my country, in harmony with those who provide the vehicle which are the necessary complement, to the end that, jointed with other means of transportation, they may meet the need of our people for easy, quick, and untrammelled transportation.—*Arizona Highways*.

Capitol Copper

California's oldest copper, boasting fifty-four years of active service, is doing daily duty up on the dome of the California State Capitol.

State Architect George B. McDougall made this announcement. When he says "copper" he doesn't mean police officer. He means that the sheet copper covering the entire dome of the California State Capitol building has been there since 1873. Its excellent condition has aroused comment among experts on copper and inquiries regarding the dome were received from the Copper and Brass Research Association of New York.

Statement From Bidders Required.

Before the Bureau of Public Roads will issue plans, specifications and proposal forms to any contractor desiring to bid on any project under its jurisdiction, it will be necessary for the contractor to file a financial and experience statement with C. H. Sweetser, district engineer, 807 Sheldon Building, San Francisco. This policy was started on October 21, 1927, and will be followed hereafter.

GRADE CROSSINGS REMOVAL PROCEEDING IS FASTER IN THE EAST THAN IN WEST

The trunk line railroads through the east have a considerably higher standard of roadway, track and maintenance than do the railroads in California. On the other hand, the passenger equipment through the east is not of as good a quality, in general, as the passenger equipment operated on California lines. Apparently, due to density of traffic, eastern roads have spent enormously greater sums than have the western lines for providing facilities for faster operation, including particularly the feature of grade separations with other railroads or highways. This is the report made to the California Railroad Commission by Chief Engineer A. G. Mott of the commission, summarizing the results of a tour of investigation of the principal states, with particular reference to transportation.

Next to Lindbergh's feat, the greatest sensation will be the fiftieth wedding anniversary of a movie couple.—*Indianapolis Star*.

In another ten years, says General Patrick, it will be perfectly safe to travel by air. Long before that, however, if traffic continues as at present, it won't be safe to travel anywhere else.—*San Diego Union*.

ROSTER
DEPARTMENT OF PUBLIC WORKS
STATE OF CALIFORNIA

C. C. YOUNG, Governor

B. B. MEEK, Director, Department of Public Works

CORNING DE SAULES, Deputy Director, Department of Public Works

GEORGE C. MANSFIELD, Editor, California Highways and Public Works

DIVISION
of
HIGHWAYS

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Port of San Jose—Not yet appointed
Port of San Diego—Not yet appointed

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Irrigation, Water Rights and Architecture

Seeing California from its State Highways



Upper left, State highway, Yosemite road near El Portal; Upper right, State highway through the redwoods in Santa Cruz County; Middle left, A view of Mt. Shasta from the Pacific highway; Lower left, Coast road near Santa Barbara; Lower right, State highway on the Ridge route.

California Highways and Public Works

Official Journal of the Department of Public Works
State of California

December
1927



Autoing in December on the Peninsula Highway,
San Mateo County, California.



Rolling the road.



State highway between Ontario and Riverside, in Riverside County.



Turning a truck upon a road turntable.

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California's Mountain Highways

By FRED S. MOODY, Member of the California Highway Commission.

K NOW California's mountains!

This is my counsel to the people of California. It is founded on years of intimate acquaintanceship with the mountains of this state, strengthened by some knowledge of the most famous of Europe's mountain passes.

In the past there may have been some excuse for those who did not get out into the high places of California. But today, when mountain scaling is possible of accomplishment in the cushioned comfort of an automobile, there is no reason why every Californian should not come to live on intimate terms with our mountain areas.

I was greatly impressed some years ago with a statement that caught my eye while preparing for a trip through Europe. I still remember the sentence. It read: "For pure enjoyment there is nothing to compare with mountain pass climbing in a car." The sentence referred to the mountain passes of Europe. So impressed was I with the facts with which the writer amplified his statement, that I included in my European itinerary automobile trips through some of Europe's most celebrated mountain passes. Since Governor Young honored me with appointment as a member of the California Highway Commission, I have been interested in making mental comparisons of the roads through the mountain passes of California with those of Europe.

COMPARISON WITH EUROPE

The charm of California's mountains carries an appeal that grows from wonder to delight and from delight to love. Nevertheless I am frank to say that I do not believe we have been as alert in locating our mountain roads to take full advantage of their scenic interest as have been the people of Europe.

It must be recognized, of course, that in the

early days mountain roads were built by the pioneers for the very necessary and practical purpose of getting the easiest road from the mountains into the valleys. The mountain roads then were essentially and wholly commercial highways. Scenery did not fit into the picture as one of its necessary parts.

Today traffic into our mountain areas is largely recreational travel, attracted there by the beauty and the inspiration that the mountains always offer and never fail to give. Scenery today is an essential factor in determining location of mountain roads.

The chief criticism that I would offer of many California mountain roads, and this criticism is offered with constructive intent, is that through the sameness of the scenery, beautiful and charming as it may be, our mountain roads tend to become monotonous.

URGES SCENIC DIVERSIFICATION

My own thought, and I am simply expressing my personal opinion, is that in the location of mountain roads, particular attention should be given to obtaining a greater diversification of the views that mountain roads offer. The more or less standardized rules of location should not have the dominating and deciding

influence in locating mountain roads that they rightly have when the location concerns business and commercial traffic lanes.

May I carry this thought a point further?

It is my opinion, and again I am voicing personal views, that the location of a mountain road should also be studied with reference to other roads traversing neighboring areas of similar topography and scenery.

The purpose of this would be to keep the amount of "repeat" scenery within the bounds of tourist interest. And I might add that all this must be read with the proviso, "as far as it is possible so to do"; for even with all the



FRED S. MOODY.

things expected from the gasoline tax, we can not rebuild mountains.

STATE SCENERY DIFFERS

Let me again emphasize the fact that I am speaking of contiguous mountain areas in California, where the scenery, generally speaking, is much the same. Undoubtedly, if California's mountain areas are to be considered as a whole, there is enough of scenic variety to satisfy everybody and, for example, there are the "furnace pits" of the Mountain Springs grade as one leaves the Imperial Valley for San Diego.

By way of contrast in central California, we find the precipitous slope of the Mount Whitney section, the nearest approach to the Alps to be found in California.

Still further to the north are the more gentle tree covered slopes of the Northern Sierra, with their rollicking streams, lashing from gem-like lakes, through the canyons to the Sacramento Valley below.

And in the coastal areas of northwestern California are the mountains covered with the world-wonderful redwood forests.

It would seem that here is variety enough for anyone. The fact must not be forgotten, however, that the usual trip into the mountains, covering generally a short vacation period, does not extend from one end of the state to the other, but is generally confined to some one section of the mountains. Hence the need for giving a changing scenic attractiveness by itself, and to each of its neighboring roads, considered in relation to it.

MORE "INDIVIDUALITY" FOR ROADS

Putting the matter tersely, I believe that there is need in California for a greater degree of what might be termed scenic individuality on our mountain highways. By that I mean the development on every road of the unique features of scenic or historic interest that they may possess.

So much for the location of mountain highways.

Now as to the roads themselves.

HIGHWAY WIDTH IMPORTANT

Mountain roads must be wide. No tourist

can enjoy scenery, however magnificent it may be, if there is any feeling of lack of safety or security. Nor should the fact be forgotten that the average visitor in the mountains is timid when riding on a narrow road.

In the matter of width of mountain roads, and the impression of security that they convey, it is my impression that, generally speaking, the mountain roads of Europe are far better than our mountain highways.

In fact, Europe overdoes, if anything, this desire to make the highways through its mountain passes so safe that they are practically fool proof. This is particularly noticeable in the matter of parapet construction along the outer side of the roads.

It may be that California autoists are better drivers than those of Europe or that they are schooled in driving on unprotected mountain roads. Certainly it is almost laughable to see the places, absolutely devoid of any indication of danger, that European road builders have protected with massive parapets to keep autoists from "going over the grade."

In places where we in California would not

even consider a "Drive Carefully" sign necessary, mammoth and imposing parapets will be found in Europe. But with all due allowance for this, there is yet considerable of sound judgment in the European view and practice that the feeling of security on a mountain road is as important a factor as scenic attraction in drawing the much desired tourist travel to it.

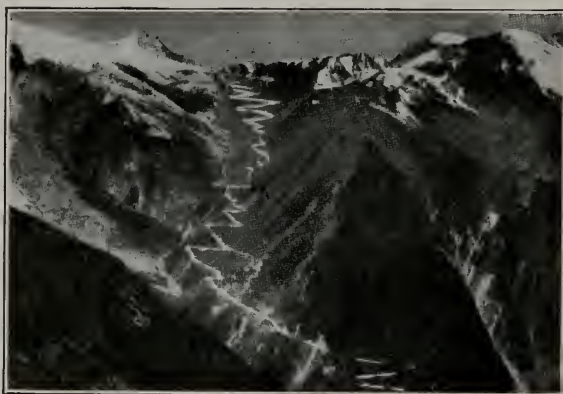
Thus far this article has centered about "the perfect" mountain road.

BUILDING POLICY ADVOCATED

Let me now say that I do not believe that construction and improvement of highways in our mountain counties should be delayed until the "perfect" road becomes attainable.

Many roads in California's mountain counties, now unimproved, can be widened, graded, graveled, oiled, and made useable for the enjoyment of the present generation. And while present roads are being enjoyed, the perfect roads will come into being as funds become available for their construction. These

(Continued on page 24)



An Alpine highway. Seven miles of road in the Stelvio Pass.

"HIGH"-WAYS IN CALIFORNIA



1—Pacific Highway—McCloud River



2—Redwood Highway—Eel River



3—Causeway on South Fork
Eel River



4—Along Lake Tahoe



5—Pacific Highway—Sacramento
Canyon



6—Along Klamath River



7—In the Kern River Canyon



8—On the Mountain Springs Grade

Building Homes for the State's Fish

*Showing How the Departments of
State "Tie-In" In Caring for and
Developing One of California's
Greatest Sporting Resources*

By P. T. POAGE, Assistant Architect,
Division of Architecture

IN ITS relation to the construction program of the Fish and Game Commission, the Division of Architecture occupies the position of both architect and consulting engineer. The work of the division in this relation consists primarily of construction and engineering development in connection with the various fish hatcheries throughout the state, and includes also such projects as the development of the State Game Farm at Yountville, the buildings of the Bureau of Commercial Fisheries at San Pedro, and certain major repairs and improvements at various other stations maintained by the Fish and Game Commission.



P. T. POAGE.

TYPICAL HATCHERY DEVELOPMENT

As an illustration of the operations of the division in carrying out this work, let us take a typical hatchery development project. The hatchery building with its troughs, teeming with thousands of small fish, is always the center of attention, and being a great public attraction is generally located where most easily accessible to the traveling public. In the design of the building an effort is made to make it blend into the natural setting, often effecting this partly by the use of local materials, as exemplified in the Mt. Whitney, Lake Tahoe and Yosemite hatcheries, in which natural stone, logs and bark are used extensively.

As adjuncts to the hatchery will generally be included a cottage for the superintendent, quarters for employees, generally in the form of a separate building, but occasionally included in the hatchery building—and

OUT FISHIN'

A feller isn't thinkin' mean—out fishin';
His thoughts are mostly good and clean—
out fishin';
He doesn't knock his fellow men,
Or harbor any grudges then;
A feller's at his finest when—out fishin'.
The rich are comrades to the poor—out fishin';
All brothers of a common lure—out fishin';
The urchin with the pin and string
Can chum with millionaire an' king;
Vain pride is a forgotten thing—out fishin'.
A feller gets a chance to dream—out fishin';
He learns the beauties of a stream—out fishin';
An' he can wash his soul in air
That ain't foul with selfish care,
And relish plain an' simple fare—out fishin'.
A feller has no time for hate—out fishin';
He ain't eager to be great—out fishin';
He ain't thinkin' thoughts of self,
Or goods stacked high upon a shelf,
But he's always just himself—out fishin'.
A feller's glad to be a friend—out fishin';
A helping hand he'll always lend—out fishin';
The brotherhood of rod an' line,
An' sky an' stream is always fine;
Men come real close to God's design—out fishin'.
A feller isn't plottin' schemes—out fishin';
He's only busy with his dreams—out fishin';
His livery's a coat of tan;
His creed's to do the best he can;
A feller's always mostly man—out fishin'.

—By Edward A. Guest

garages and other necessary service buildings, all designed in the same feeling as the main building.

WATER QUALITY IS BIG FACTOR

The quality of the water supply for hatching purposes is the largest single factor in the selection of a hatchery site. The source of supply is generally a stream in which is built a dam or other form of diversion structure leading the water into a pipe or flume from which it is discharged into a settling tank designed to remove floating and suspended matter. In some cases it may be necessary to run this pipe line or flume several thousand feet, in order to obtain the proper head. From the settling tank the water goes to the hatching troughs, passing through and returning to the stream from which it came.

As the fish will live only a comparatively short time if the flow of water is stopped, every precaution is taken to see that the supply is constant, and in certain instances emergency service is provided from a pump or other source.

Lack of head to supply sufficient pressure, or possible pollution of a stream may require the development of a separate source of supply for the domestic uses of the attendants and the visiting public. This is frequently

accomplished by developing springs and occasionally by digging a well.

FEEDING THE FISH

Electric energy is practically essential for lighting and power purposes, the latter use being for grinding food for the fish and for pumping water where necessary. In some instances the site is far removed from a public utility service line and it then becomes necessary to generate power, which may be done by a water wheel, if satisfactory water supply is available, or by a gas engine and storage battery set.

The disposal of sewage from the hatchery buildings is commonly cared for by a septic tank, which though quite small must be carefully designed and located so as to prevent pollution of any stream or other source of water adjacent to the site.

MAJOR PROJECTS HANDLED BY DIVISION

The following is a brief description of the major projects which have been handled by the Division of Architecture for the Fish and Game Commission, or which are under construction or contemplated at the present time.

Mt. Whitney Hatchery

This hatchery, erected in 1917, is located at Independence, Inyo County, at the eastern base of Mt. Whitney. Architecturally it is one of the most interesting of the hatcheries in the state, the native field stone of which it is constructed giving it the appearance of growing out of the rocky desert on which it is located. The desert, however, is only a foreground to the vast bulk of Mt. Whitney and its neighboring peaks in the background. It is this great mountain range which has permitted and made effective the transplanting of an architectural style from Norway to a desert in California.

Lake Tahoe Hatchery

This hatchery was constructed in 1920, near Tahoe City on the northern shore of the lake. In its construction field stone from the site forms the lower portion of the walls. The cedar bark forming the covering of the upper walls is intended to tie the building in with the tall timber in which it stands and the unusually steep roof is expressive of the snow country in which it is located.

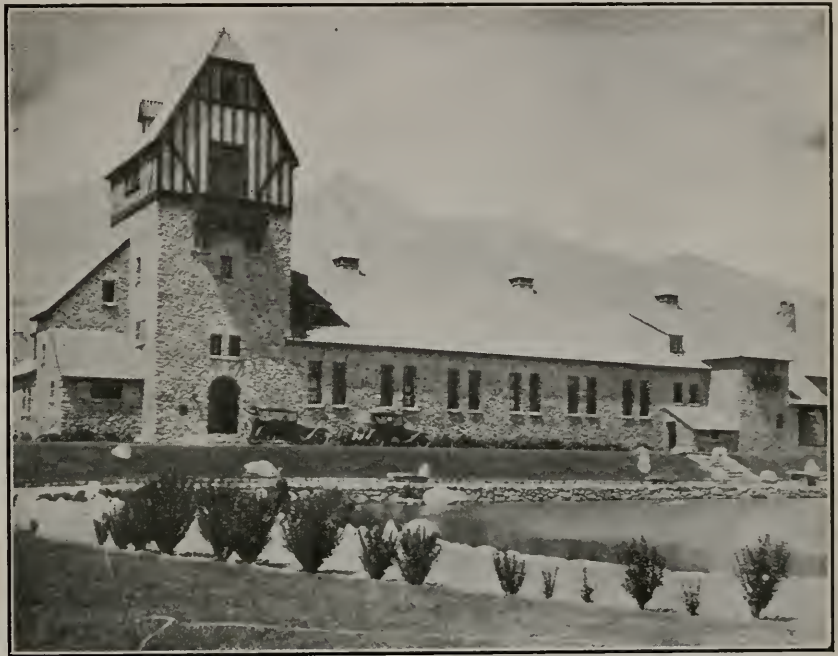
Adjacent to the hatchery there have been completed during 1927 a cottage for the superintendent and another building containing quarters for employees, garages and work space.

Bureau of Commercial Fisheries at San Pedro

This station consists of two masonry buildings, housing the offices and laboratories of the Bureau of Commercial Fisheries, to which is delegated the regulation and control of commercial fishing throughout the state. The buildings were erected in 1921 and are examples of the modern adaptation of Spanish architecture.

Feather River Hatchery

This hatchery was erected in 1924, replacing a temporary hatchery which had been operating in a tent previous to that time. It is located at Clito, Plumas County, and supplies fish for one of the finest angling regions of the state.



Fish hatchery, Mt. Whitney, built by the State Department of Architecture.

Blackwood Creek

As a supplement to the Tahoe Hatchery, a small hatchery was erected at Blackwood Creek, a few miles distant, in 1926.

Big Creek Hatchery

Largely on account of increasing pollution of the water supply, it became necessary for the Fish and Game Commission to abandon the hatchery occupied at Brookdale, Santa Cruz County, and in 1927 a new hatchery was constructed near Swanton, in the same county. This project as completed consists of the hatchery building and two cottages; one for the superintendent and one for employees. The material used in the construction is for the most part redwood, of which great quantities are cut in this region. The water supply is from Big Creek, which flows through the site.

(Continued on page 30.)

San Gabriel Water Problems

Legal and Physical Issues Involved in One of California's Most Important Water Hearings

By HAROLD CONKLING, Chief, Division of Water Rights.

ONE OF THE most important hearings in the history of the Division of Water rights was that held in November in Los Angeles, in which the issues involved diversion of water from the San Gabriel River in Los Angeles County. In view of the importance of the issues involved, the many cities and communities and the large number of people directly concerned in the disposition of this case, a statement of some of the legal and physical problems that the case involves we believe will be timely, and of interest to the people of California.

For the benefit of the lay reader, it might be well to summarize as follows in question form these legal and physical problems:

LEGAL POINTS

(1) Are riparian owners entitled to have the flood waters of streams of the character of the San Gabriel flow by them undiminished in quantity?

(2) Do the lands overlying that portion of the underground water supplied in part by the river have the same or similar riparian rights as those bordering the stream?

(3) If flood waters which would be injurious if unregulated, are stored for purposes of flood control, what is the character of rights to such stored flood waters when they are released from flood control reservoirs?

(4) To what extent, if any, is the storage of water for flood protection purposes subject to the provisions of the Water Commission Act?

(5) Do lands riparian to the stream or overlying the area the ground water of which is replenished by percolation from the river, have a preference in rights to acquire waters released from flood control reservoirs or are such waters equally available for acquirement for use outside of that area?

(6) Can rights to waters which assist in causing percolation, but which themselves would waste into the ocean, be acquired if provision is made for restoring

percolation equivalent to that which would have occurred under natural conditions?

(7) Are rights to store water for flood control purposes limited to such parts of the stream flow as cause actual injury to lands adjacent to the stream?

PHYSICAL PROBLEMS

On the physical side the questions which arise are:

(1) Is it possible under the varying conditions of waterplane and flow to work out an equation or curve from work so far done, on the relation of discharge from canyon to percolation into the stream bed below, which will be applicable over the entire range of conditions?

(2) What are the future needs of the valley and what steps can be taken to conserve the surplus of the wet cycles to fill the deficiencies of the dry cycles?

(3) What are the present and future needs of the various applicants?

GEOGRAPHY OF BASIN

The position of the area may be described as follows:

San Gabriel Basin joins Los Angeles on the east and north-east. The valley area is divided into two portions; the upper is called San Gabriel Valley, covering 200 square miles of valley floor and including 14 incorporated cities from Pasadena on the west to La Verne on the east. The valley is bounded on all sides by hills or mountains.

Through the southerly range of hills, San Gabriel River, augmented by tributaries, has cut a pass called Whittier Narrows or Paso de Bartola and there debouches into the Coastal Plain, containing several towns and cities, the principal of which is Long Beach.

RUN-OFF FIGURES

San Gabriel River supplies 76 per cent of the mountain run-off tributary to San Gabriel

(Continued on page 42.)



San Gabriel River in Flood—This picture was taken on February 16, 1927, just below the mouth of San Gabriel Canyon. Discharge 18,000 cubic feet per second. The river was measured at four points by means of cables stretching across the river on which ran cars capable of carrying two men. These were equipped with electric lights for night work. One of these stations is just above the point shown in the picture. Percolation was about 1700 cubic feet per second average for day.

SAVE THE BEACHES

By C. C. YOUNG, Governor of California.

DOES THE PUBLIC realize that California, with her many hundreds of miles of picturesque and beautiful coast line—a coast line which ought to be a heritage for all future generations—is rapidly throwing away this heritage?

Does it realize that of her beaches, the greater part has passed into private development and is denied to the pleasure of all our people? Does it know that of the little that is left some of the fairest parts are in danger of defacement through private commercializing and exploitation?

This is a plea to the public, to the members of our automobile associations, to the leaders of the oil industry, that they unite in creating a sentiment which will stay the hand of the oil promoter until some plan can be worked out which may protect his legitimate interests, and at the same time preserve for California one of her greatest charms.

Not so very many years ago, California's redwood forests were in similar danger of destruction. Trees that had taken untold centuries to grow, whose beauty had charmed and delighted the nations of the earth, were being converted into grape stakes and railroad ties, leaving only unsightly patches of scarred and denuded ground.

An organization was formed to "Save the Redwoods," particularly along our main trunk highway system.

Members of the California Highway Commission and other state and county officials cooperated to the utmost. Private organizations and patriotic citizens joined in the effort to save these mighty forests. A Park Commission has just been organized which will help complete this work.

But with all due credit to these private individuals and public organizations who joined hands in this task, the fact remains that the redwoods were saved largely because the owners of these forests stopped cutting along the highways until time was accorded public and private organizations and patriotic citizens to formulate a practical plan for saving the trees, thereby earning the everlasting commendation of the people both of California and the whole world.

Now the necessity has arisen to "Save the Beaches."

The wondrous and spectacular charm of California's beaches is menaced by the activity of oil interests.

It is the same old question that arose in the redwoods.

It is a question of temporary profit taken against a permanent scenic and spiritual enrichment.

It is a question of pennies now against dollars in the future.

It is a question of this generation against the generations that are to come.

There was no question when the redwoods were imperilled what the people of California thought. Neither is there any question as to what the people of this state think as far as its beaches are concerned.

Oil is one of California's greatest and most beneficent resources. The recovery of oil constitutes a glorious chapter in California's industrial history.

But granting all this, the fact remains that first values must come first. The permanent scenic value of the beaches of California are immeasurably greater than the value of all the oil that their sands can ever contain.

We commend to the oil interests of California the example of the owners of the redwood forests.

Let drilling be stopped until a method of saving these beaches can be worked out.

This method may come in several ways.

It may be that the state can aid in the situation by the extension of the rights of way of its highways.

It may be that the law under which drilling on tidelands is being carried on will be declared unconstitutional. If such is the case, the effect will be to stop drilling when such determination is reached.

It may be that the oil wells can be drilled on the high beaches away from the highway, thus securing practically all the oil and at the same time saving the beaches.

It may be that public spirited men and women will join together to purchase and dedicate to the state the rights of oil operators, if the tideland lease law is held to be constitutional. Memorial groves in the redwoods, dedicated in perpetuity to the enjoyment of the people of the world, is proof that such public spirit exists.

Certain it is that whatever the method of relief may be, if time only is given, some way will be found of preserving these beaches, their beauty unmarred and their charm unimpaired, as a heritage to humanity for all time to come.

Governor Young Moves to Save Recreational Areas to California

INTIMATELY associated with the extension of good roads in California is the preservation of the natural parks and playgrounds that either lie among the present state highways or that can be made available to the people of California.

Governor C. C. Young has appointed a group of five men as the State Park Commission to "make a comprehensive survey of the state as a basis for the development of a well-balanced park system." This board will also administer the \$6,000,000 bond issue. If the issue is approved by the voters of California, at the next general election, this money is to be voted for parks in California, with the proviso that each dollar of this fund shall be matched by another dollar from other sources. On this Commission are:

William E. Colby, Berkeley, associate of John Muir.

Dr. Ray Lyman Wilbur, Palo Alto, president of Stanford University.

Henry W. O'Melveny, Los Angeles, former member of the City Park Commission of that city.

Major Frederick Russell Burham, Los Angeles, explorer of international reputation.

Ex-Senator W. F. Chandler of Fresno, an authority on recreational conditions in the interior valleys of California.

Present state parks as are follows:

California Redwood Park—Located in the Big Basin in Santa Cruz County; area 9380 acres.

Bidwell State Park—Consists of approximately 100 acres on the boundaries of Big Chico Creek in Butte County.

Burney Falls Park—Contains 335.25 acres in Shasta County.

Mount Diablo State Park—Consists of 639.87 acres of land near the summit of Mt. Diablo in Contra Costa County.

Humboldt State Park—Consists of 1560.51 acres of some of the choicest redwood lands in Humboldt County, purchased by the state through the cooperation of the Save-the-Redwoods-League, the California Federation of Women's Clubs and other interested agencies. In addition to this 1526.98 acres have been secured by gifts of lands or by cash donations for the purchase of lands. Also in addition to both of the above a tract of U. S. Govern-



Beautiful Burney Falls in Shasta County.

ment land, containing 83.35 acres, was secured for the state by an exchange of land. While the original act provided only for the acquisition of land in Mendocino and Humboldt counties, land has been acquired by gift both in Del Norte and Mendocino counties outside of the area designated by the act. This area has been administered thus far under the name of the Humboldt State Park.

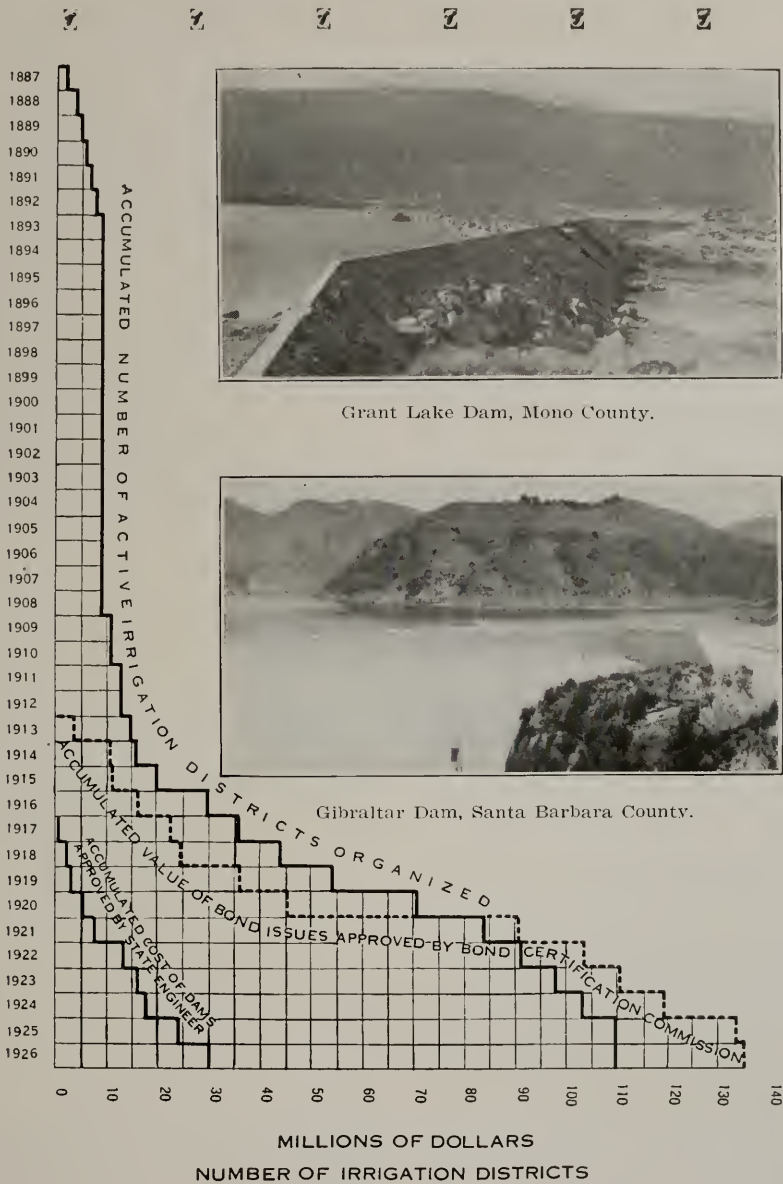
Governor Young's letter naming the members of the Commission was widely commented upon over the state for the keen realization that it displayed and the interest that it evidenced in the importance to California of the development and extension of the recreational areas of the state. The letter follows:

In the appointment of the State Park Commission, which I am today naming, I have given a great deal of time and very especial care. This is a new commission, having charge of the recently created Division of Parks, and operating in the State Department of Natural Resources. Its object is to unify the administration of all parks, sites of historical interest, and the like, which are owned and controlled by the state, or may be hereafter acquired, and to make a comprehensive survey of the state as a basis for the development of a well-balanced state park system.

California is growing very rapidly, and its sites of natural beauty suitable for parks and public

(Continued on page 29.)

Tells Story of State's Growth



The above plate represents the growth of activities under three of the most important statutory functions of the Division of Engineering, viz: Investigation of feasibility and organization of irrigation districts, reporting on propriety of proposed bond issues for irrigation development, and approval of plans for dams and the supervision of their construction. Here is a story that it tells:

In 1887 there were 7 irrigation districts in California; in 1926 there were 110 irrigation districts.

In 1912 the State Bond Certification Commission began its work. In 1926 the accumulated value of the bonds issued by that commission was \$136,000,000.

In 1917 the duty of approving plans for dams and supervising their construction was vested in the Division of Engineering. In 1926 the accumulated cost of dams approved by the State Engineer was \$30,000,000.

Building a Highway While 6000 Automobiles Move Along the Road

By C. N. AINLEY, Resident Engineer Division of Highways, State Department of Public Works.

A state highway paving contract interesting in the problems which it presented and the wide range of construction involved was that for the Rincon road extending from Ventura to Benham subway, 12.5 miles. This contract was let in October, 1926, to J. F. Knapp of Stockton, and was recently completed, construction work having covered a period of about 11 months.

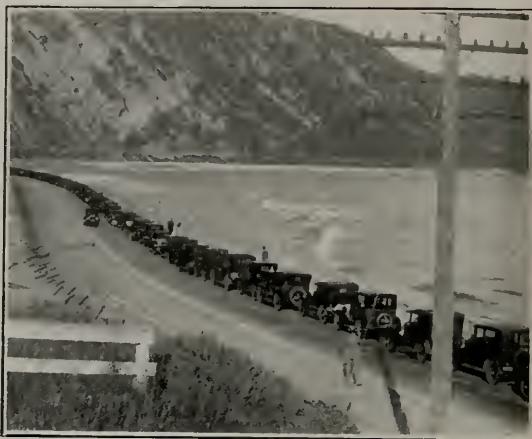
Most important of the problems involved was that of carrying on the paving work expeditiously and keeping the road open to traffic at all times. Detours could not be arranged, as the highway lies between the Southern Pacific Railroad tracks paralleling the beach and closely hemmed in at many places by bluffs and hills. Thus it was necessary to pave half the roadway at a time and keep the other half open to traffic. As from 4000 to 6000 vehicles daily traverse this section during the summer months, the difficulties of keeping the ordinary traffic moving were enough without adding to them. It was this situation which impelled the contractor to use an industrial railway for handling materials between the bunkers and the paving mixer so as to keep his trucks out of the controls as much as possible. While it was necessary to shift the track from one side of the road to the other and to cut out a bed for it in places on the railroad right of way, use of the industrial railway was a big factor in the successful handling of the job, both from the standpoint of economy and of facilitating operations.

The new seawalls were built by Otto Parlier of Tulare under a subcontract.

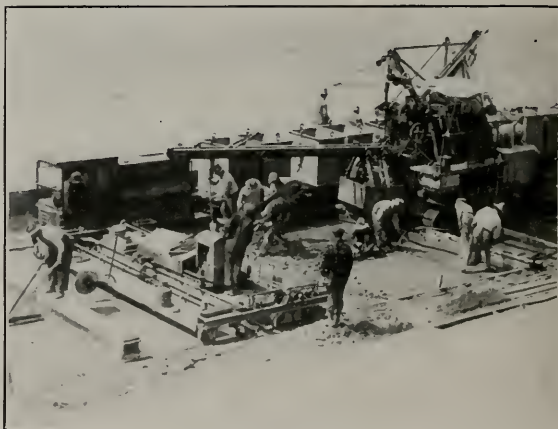
The speed with which Mr. Parlier carried on the work saved the highway at this point from the fury of the January storms.

During one series of extra high tides one section of the cofferdam was washed out three times in three days. Other sections of the cofferdam were washed out, but the wall being up to roadway level no damage was done except to delay the placing of the top section.

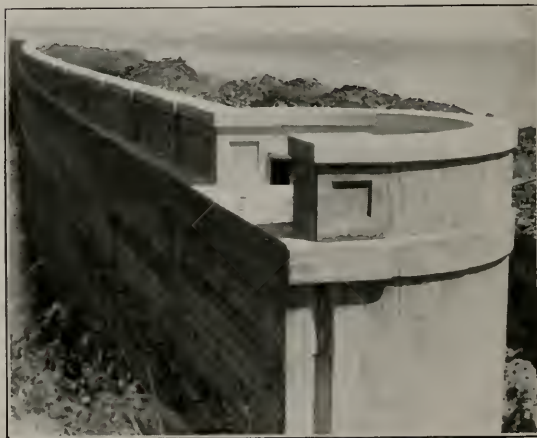
The handling of the heavy traffic through this contract with as little inconvenience and delay to the public as possible, was quite a problem. In the early part of the work, while the grading was going on, the mud and sand had to be heavily surfaced with rock to carry the heavy trucks and trailers. Heavy trucks,



The line of automobiles.



Placing of concrete pavement.



The completed wall.

often underpowered and overloaded, and with trailers, were continually getting out of the beaten track, often tying up the traffic for hours. It was necessary to keep a tractor handy at all times to pull them out.

With the coming of summer there was a large increase in traffic. The usual accumulation of cars, during the hours of heavy traffic, and a long control, was 60 to 100. On Sunday the accumulation was 100 to 200 cars. On May 30, Decoration Day, with a long control, the string of cars was two miles long at times.

At the beginning of the work, when it became necessary to put sections of the road under control with one-way traffic, flagmen were put on at each section. When the flagmen were situated so that they could see each other, signals were used, but at other sections a flag was used which was given to the last car to be handed to the flagman at the other end. The method of passing the flag on the last car with a long control and heavy traffic, which included slow moving trucks, was very unsatisfactory. Some drivers unfamiliar with the system would try to hand the flag to everybody along the road, others would forget to hand the flag back and carry it on, and others would deliberately throw the flag away or carry it by. This caused many delays. When the flag did not come through on time, there was always a doubt as to whether the flag was lost or a truck was broken down or traveling slowly. With several sections under control, so that there would be several stops and often delays, there was considerable dissatisfaction and complaint.

The system was then changed and one long control put on which included all the short sections, and a riding flagman put on to carry the flag on the last car instead of giving it to the driver. There was an immediate improvement in traffic conditions. Traffic was speeded up, and the annoyance of numerous delays eliminated. If there was a blockade in the line, the riding flagman went ahead to straighten it out. It was convenient to have several of the flagmen deputized and wear badges, but it was found that men could not be deputized indiscriminately without causing trouble.

Actual length of the pavement built was 12.2 miles, part of it being "second story" with an existing 15-foot concrete pavement as a base and part of it new construction. The standard width was 20 feet, which was increased to 30 feet behind seawalls. In connection with the paving two new seawalls were built, one 510 feet and the other 558 feet in length, and the old seawalls, constructed in 1914, were extended and raised to provide better protection to the highway and to the traveling public.

This contract was in charge of S. V. Cortelyou.

District Office Garden

At San Bernardino Wins Praise for its Beauty



Group of State Highway officials in the garden of the San Bernardino office.

The district grounds and garden in San Bernardino were signally honored when honorable mention was accorded them in a City Beautiful contest sponsored by the San Bernardino Chamber of Commerce. The following letter received by District Engineer E. Q. Sullivan is self explanatory:

November 10, 1927.

State Highway Commission,
San Bernardino, California.
Gentlemen:

The City Beautiful contest sponsored by the San Bernardino Chamber of Commerce was closed when the final awards were made by the judges.

The judges were very favorably impressed with your entry, and requested that you be given a special honorable mention.

We congratulate you, and thank you for your cooperation in making the contest a success, and in adding to the beauty of the city. San Bernardino is becoming very widely known as a city of beautiful homes and gardens. There is nothing, we believe, which adds more to the attraction of a city and is more pleasing to the eye than a home surrounded by flowers and shrubbery and well-kept lawns. The beauty of our city is one of its greatest assets. It must be a source of considerable pride to you to know that you have helped in this connection.

Assuring you of our appreciation of your untiring efforts, I am

Very cordially yours,

SAN BERNARDINO CHAMBER OF COMMERCE.

(Signed) J. L. MACK, President.

(Signed) R. H. MACK, Secretary.

division engineer Division VII, with headquarters in Los Angeles. C. N. Ainley was the resident engineer. Ezra Kaufeld was superintendent on the job for the contractor, J. F. Kuapp.

Elephant Owners, Take Notice! Contractor Hauser Through with Burying Them

[From *The Humboldt Times*, Eureka.]

W. H. Hauser of the Hauser Construction company, has demonstrated that he is a successful contractor, but when it comes to burying elephants, he is a failure, that is from a financial viewpoint.

This became known Wednesday when one of Hauser's friends unintentionally "let the cat out of the bag."

Several weeks ago "Big Diamond," the prize elephant of a circus that was touring this part of the country, collapsed after he had labored the greater part of the day pushing trucks through places where they were unable to travel under their own power, and died a few days later.

He passed away just north of Orick where the new Redwood highway is being constructed. There are two contracting companies working on this new highway, but Big Diamond died on the section that is being constructed by Hauser.

The problem that confronted the manager of the show and also Hauser was to bury the elephant.

The manager of the show stated that he had engagements to fill in Blue Lake and other towns along the coast and he could not afford the time to bury Big Diamond. He stated that the elephant's hide was worth about \$600 or \$800 and told Hauser that if he would see the elephant was buried he could have the hide.

The contractor took him up on the proposition and put several men to work with axes, peeling off the hide, which was about two inches thick, and then brought one of his big steam shovels, which was working about two miles away, and dug the grave. The elephant weighed about seven tons. After the hide was removed, two tractors brought to the scene, hooked onto the carcass and pulled it into its last resting place.

The hide, which weighed more than a ton,



The elephant and Mrs. Hauser.

was loaded onto a truck and brought to the Eureka Tannery to be tanned. The tannery informed Hauser that the plant was not equipped to tan elephant hides and Hauser was up against it again. The hide soon began to give off an unpleasant odor and he was asked to come and remove it. A truck was

dispatched to the tannery for the hide. By this time it was in such a state that tanning would have been impossible. It was therefore taken back to the place where the carcass was buried, the steam shovel dug another grave, and the hide was deposited in it.

The intentions of the show manager were no doubt of the best and the hide was no doubt worth what he said it was, but Hauser is said to have lost between \$300 and \$400 on the proposition.

And the moral is: Never accept a dead elephant.

RECORD IS CLAIMED

Concerning this elephant episode CALIFORNIA HIGHWAYS AND PUBLIC WORKS is in receipt of the following article from the headquarters of Highway District One at Eureka:

Probably on no other state highway contract in California has the contractor had to bury an elephant. The contract north of Orick was a very fitting place for an elephant to lay down and die, it being in a real California jungle and among the big Redwoods.

Imagine the thrill one would get driving along through this jungle over the old narrow county road, and early on a foggy morning and suddenly, without warning, see two large elephants approaching. Such was the thrill of Resident Engineer Hubbs.

The elephants belonged to a circus traveling the highway.

In passing over the contract the heavy circus wagons could not get through the mud, so "Big Diamond," the large elephant, willingly pushed the circus trucks through the mud and after the last truck was safely over, he lay down and died.

The rest of the story is told in the article from *The Humboldt Times*, quoted above.

“Surface Treatment” Method of Oiling Roads

By T. E. STANTON, Assistant Highway Engineer.

The present extensive use of fuel oil on the Pacific Coast is the direct outcome of experimental work conducted in 1923 by the Oregon State Highway Commission followed in 1924, 1925 and 1926 by several hundred miles of bituminous treatment. Success in the Oregon experiments in 1923 and of later work was due in a large measure to the prior development of an efficient maintenance organization.



T. E. STANTON.

The favorable results in Oregon in the preservation of modern crushed rock and gravel surfaces by the use of fuel oil led to

similar experimental work in California in 1925, followed by the construction of 245 miles of oiled state highway in 1926 and over 600 miles in 1927.

The Washington and Idaho State Highway Departments also constructed experimental oil treated sections in 1927, using methods adopted from Oregon practice.

SPECIAL STUDY MADE

So important does the Bureau of Public Roads consider this matter that it last year,

in cooperation with the California State Division of Highways, initiated a special investigation of the subject, through the Regional Office, San Francisco, in charge of Dr. L. I. Hewes, Deputy Chief Engineer.

As a result of this investigation, a complete and valuable report has been drawn up by



Oiled section of the Pacheco Pass road in Santa Clara County.

Mr. C. L. McKesson, Material and Research Engineer of the California Division of Highways, and Mr. W. N. Frickstad, Highway Engineer of the Bureau of Public Roads.

Much of the data on which this article is based was obtained as a result of the above investigation and will be found set forth in detail in the report of the engineers.

SURFACE TREATMENT

Oregon uses the “surface treatment” method almost exclusively. In California probably 75 per cent of the roads oiled to date received the surface treatment and on the balance the oil mix method was used. There is no doubt, however, but that the oil mix method will be used to a greater extent in future work.

Surface treatment with light oil, as conducted in California, contemplates impregnation of the surface crust of a compacted road with asphaltic oil.

The type of rock surface which lends itself most readily to a good job of this type is the fine crushed rock surface, using rock of maximum one (1) inch size, which can be

(Continued on page 28.)



Oiled road in El Dorado County.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS.

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Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

BERT B. MEEK-----Director
GEORGE C. MANSFIELD-----Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 4 DECEMBER, 1927 No. 12

Eighteen Years of Good Roads in California

It is a significant fact that California is preparing to spend a larger sum on its state highways in 1928 than the entire bond issue of \$18,000,000, voted in November, 1909, for these roads.

It is also significant as showing the growing appreciation in California of the value of good roads that the general opinion at the time the \$18,000,000 bond issue was voted was that that sum would complete California's state highway system. Today no one thinks for a moment that the approximate expenditure of \$25,000,000 on state highways in 1928 will even begin to satisfy the ultimate highway needs of the state.

The reason that the people of California are today willing to spend \$25,000,000 a year on state highways is because they know that there is a tremendous balance on the credit side of California's highway ledger. In this profit every man, woman and child, every county and community, every city and village in the state shares.

That refers to money alone and does not take into account the increased human happiness and well-being that good roads have brought with them.

Use Four Crops To Pay Dirt Road Cost

It takes Iowa's entire corn, oats, wheat and barley crops to pay her dirt road transportation bill, according to figures compiled by the highway commission of that state. The cost of operating the 699,000 motor vehicles registered in 1926 is estimated at \$314,608,000, while the value of the four principal crops that year was \$313,367,000.

As a means of reducing the transportation bill, the commission advocates paving all the main highways and graveling roads with light traffic. To prove this claim, figures are quoted

showing the saving on the three principal items, new cars, gasoline and tires, between dirt, gravel and paved roads.

Iowa spends \$120,000,000 annually for new automobiles, it is stated. The average life of a motor vehicle on dirt roads is given as five years, on gravel six years and on pavement seven years.

The annual bill for gasoline in the Hawkeye state is estimated at \$50,000,000. Most of it is used in propelling vehicles on dirt roads, and tests made by the Iowa agricultural college show that a gallon of gas will carry the average car 14 miles on a dirt road, 21 miles on a gravel road and 31 miles on pavement.

The annual expenditure for tires is figured at \$30,000,000. The annual cost of tires for an average motor vehicle is figured at \$31.65 on concrete pavement, \$63.30 on gravel and \$158.25 on average macadam.

Apparently the people of Iowa have come to the conclusion that the cost of riding on dirt is too high, for fifty-three counties have to date voted to authorize a total of \$60,085,650 in highway bonds. From January 1 to August 31, 200 miles of paving had been completed and considerable more will be finished before freezing weather comes. Contracts for 186 miles of paving were let during July, August and September. More contracts will be let later, and it is quite apparent that Iowa will be some distance ahead of Minnesota in paved road mileage by the end of 1928.

The Common Possession of Every Californian

The summary showing "what a Californian owns" circulated by Californians Inc., through millions of homes in all parts of the United States, is equally interesting for home consumption.

Climate: Year-round producing climate. The Californian can work, grow crops or play every month in the year.

Growth: From 3,500,000 to 5,000,000 population in six years—three times faster than the United States average. This builds value and stability for business, investments, markets, property, opportunity.

Wealth: Twice the national average of wealth, twice the average number of savings bank depositors and twice the average deposit. Only three states report more income tax returns; none has so many automobiles per capita.

Health: Six of the fifteen most healthful cities in the United States are in California. U. S. government investigations prove Cali-

fornia children bigger around the chest and taller than the average.

Education: The Californian's schools share first rank only with Massachusetts in efficiency. Five states have larger enrollments; only two exceed California's expenditures.

Recreation: Four national parks, a thousand miles of ocean shore, a thousand-mile-long Sierra playground, 30,000 square miles of national forests, 42,000 miles of paved highways and improved roads. Year-round motoring, golf, fishing, sailing, week-ending out of doors.

Crops: More than \$600,000,000 yearly. Six million acres under irrigation at a cost of \$200,000,000, with great mountain reservoirs supplying abundant water whenever needed during the long, sunny growing seasons.

Industry: One of the youngest states, California is eighth in value of manufactured products.

Markets: From San Francisco's great harbor, the largest on the Pacific coast, the Californian successfully sells his manufactures and crops throughout the western and eastern states, and exports enormously throughout the world.

"Good Old Days" Does Not Apply to Roads

It is significant that the expression "good old days" is never used with reference to highways.

But just how bad those old days were, again referring to highways, never dawned upon us until the other day we began to delve in a history of New Hampshire of the date of 1792.

Here are some of the things that we discovered concerning highway building methods in that state at that time:

In surveying roads, the length of a man's arm to every half chain was allowed for inequality of surface.

In view of the fact that few surveyors were skilled in finding the variation in their compasses by the sun's amplitude, it was proposed that durable monuments should be erected in convenient places on a true meridian, by which all surveyors should be obliged to regulate their compasses. The general assembly voted down the proposal.

For crossing small streams beaver dams were found most convenient. New roads, therefore, were laid out to accord to the location of the dams built by those useful animals.

The expense of making and keeping roads in repair was generally borne by the inhabitants of the towns through which they passed, though in some instances roads were laid out at the public expense.

It was a custom for those who were at work on the highways to invite travelers to take a drink, and expect a gratuity in return. This custom, however, had largely been abolished in 1792.

JUST TEN YEARS AGO

By J. H. SKEGGS, District Engineer, in the Santa Cruz *Sentinel*.

A review of historical data in relation to highway construction invariably discloses some point of interest for "California Highways." In looking through the old files in the District IV offices of the Division of Highways at San Francisco, the following was found under the date of April 19, 1916. It is a plea from the Santa Cruz Chamber of Commerce that the newly graded road (the state highway from Los Gatos to Santa Cruz) be kept watered, so that the "splendid work done by the Highway Commission would be maintained." In order to emphasize the necessity of granting their request, a traffic count was kept.

S. A. Palmer, then president of the Santa Cruz Chamber of Commerce, and W. S. Moore, chairman of the Good Roads committee, in the letter reports the count as: 613 automobiles, 32 motorcycles and 29 buggies.

It is not quite definite from the above at just what point on the highway the traffic count was taken by the Santa Cruz Chamber of Commerce. Nevertheless, it is of particular interest at this time to compare the figures in this old count with the latest check made by the State Division of Highways, covering a 16-hour period on Sunday, July 17, 1927. This tabulation shows that at the city limits of Los Gatos 9616 automobiles passed during the 16-hour period of the count, while during the same period at the city limits of Santa Cruz 7712 automobiles passed the observer.

The 1927 count makes no reference to buggies, indicating that the horse-drawn means of transportation has dropped to almost a negligible factor in present day highway traffic study.

(From the Brawley News.)

In the "Ten Years Ago Today" column of the *Calexico Chronicle* Wednesday, was the following excerpt:

"Hopes for a highway that will give an outlet for the irrigated section of the Imperial Valley to Los Angeles and to Yuma are brighter than at any time in the past, since the conference in San Bernardino yesterday between the state highway commission and the supervisors of San Bernardino, Riverside and Imperial counties."

Is it possible that only a decade has passed since the highway between Brawley and Banning was the "Rocky Road to Dublin"? Since the trip was a matter of a full day the state of the weather on the west side of the Salton sea was all important before embarking upon so hazardous an undertaking as passage over the Salton sea road.

Between Brawley and Yuma and between Brawley and Los Angeles extend ribbons of improved roads, over which the automobile driver may speed at the limit allowed—and more—if the roadway is clear.

Oliver Wendell Holmes wrote in 1857 after seeing an old fashioned bike with a high front wheel: "There seems to be nothing left to perfect in the way of human locomotion but aerial swimming which some fancy is to be a conquest of the future.—Motor Chat.

California Highway News and Comment

1 1 1 1 1 1

IN ACCORDANCE with its policy of holding hearings on the ground and its meetings in different sections of the state, the California Highway Commission visited a number of southern California counties in November. A meeting of the Commission was held in Los Angeles.

Members of the Commission making the trip were Ralph W. Bull, chairman; Commissioners J. P. Baumgartner, M. B. Harris and Fred S. Moody. Commissioner Joseph M. Schenck was absent in the East. Other members of the party were B. B. Meek, Director of the State Department of Public Works; R. M. Morton, State Highway Engineer; E. Forrest Mitchell, secretary; George C. Mansfield, editor CALIFORNIA HIGHWAYS AND PUBLIC WORKS, and district engineers S. V. Cortelyou, E. Q. Sullivan and L. H. Gibson.

At a meeting held in San Bernardino, representatives of that county asked that the Commission concentrate upon grading, graveling and oiling the desert stretches of the highway between San Bernardino and Needles on the Arizona border and San Bernardino and Calada on the Nevada border. This was asked to be completed before any permanent pavement projects were undertaken in southern California.

Imperial County desired the widening of present pavement in the Imperial Valley and the pavement of the uncompleted portion of the El Centro-San Diego highway.

San Diego County emphasized the completion of the latter highway as the most important phase of the state highway situation there.

A new location on the coast route between San Diego and a pavement north of La Jolla were also asked.

In Los Angeles members of the party were the guests of the Board of Directors of the Automobile Association of Southern California. Henry Keller, chairman of the Good Roads Committee, outlined the association's program for southern California. The relief of traffic congestion at the Newhall tunnel, a second and auxiliary route for travel now going by way of the Ridge Route, and the inclusion into the state highway system of gaps at both ends of the Mecca and Blythe route were major recommendations in this program.

In Ventura County an inspection was made

of oil drilling operations at the Rincon parapet.

In Santa Barbara discussion centered chiefly on ways and means of preserving the scenic values of the highways, with the suggestion that California should definitely undertake securing rights of way sufficiently wide to assure the preservation of places of particular beauty, whether such beauty consisted in stretches of beaches or a fringe or group of trees.

Santa Barbara also voiced its desire to further beautify the state highways in that county with tree and shrub planting. The Commission was also asked to give consideration to routing travel through cities away from and around congested traffic centers.

San Luis Obispo was chiefly interested in the continuation of active work upon the coast road from San Simeon to Carmel and further work upon the Cholame lateral.

Policies, problems and projects were discussed by members of the official party at the various conferences held.

INYO AND MONO COUNTIES HAVE NEW ROAD PROBLEM; IT'S THEIR "RELATIVES"

Humboldt County may have a unique highway problem in its elephant, writes F. G. Somner, highway engineer for the Ninth District, but Inyo and Mono counties have a road problem in relatives.

Here is the way Mr. Somner tells the story:

"EMBARRASSING MOMENTS"

After several narrow escapes from colliding with loose stock on the state highway in Owens Valley, Inyo County, it occurred to me that it was high time for action. After considerable trouble, I succeeded in identifying three herds and the district attorney's office was requested to prosecute the cases. Imagine my embarrassment upon being advised by my friend Jess Hession, district attorney, that warrants had been served on his first cousin, his wife's cousin and Sheriff Hutchinson's brother-in-law. He gamely remarked that I had "selected a good place to start."

I then decided to direct my efforts to the stray stock on the highways in Mono County. My embarrassment was complete when in response to the first complaint, was informed by Sheriff Dolan that, running true to form, my latest victim was the father-in-law of the superior judge of Mono County.

"Park" Influence Outside Says Commissioner Moody

"Park the influence you bring with you on the outside of the Highway Commission's door," is the substance of the advice that Commissioner Fred S. Moody gives to delegations seeking to consult the Highway Commission on road matters.

Speaking at a dinner tendered Director Meek and the members of the California Highway Commission at San Diego, Mr. Moody replied directly to one of the speakers, who complained of inability to "mass" sufficient "influence" to secure favorable action on a road project that he favored:

"You do not need influence," Mr. Moody said to him. Continuing, he declared that the policy of the Commission was that of the "open door," and "open decisions openly arrived at." The Commission, Mr. Moody declared, was not at all interested in "influence" as a factor in determining its action, but it was interested and interested alone in the merits of the proposal. An argu-

ment based upon merit, he declared, needed no influence to support it.

Reconnaissance Survey of Kings River Highway

At a meeting of the State Highway Commission held in Los Angeles on November 16th, the Commission authorized District Engineer Wallace of Fresno to proceed with a reconnaissance survey of the Kings River Canyon. The resolution of the Commission declared that if the reconnaissance developed the advisability of making a location survey at a later time that the offer of the Fresno board of supervisors to bear half the cost of such survey would be accepted.

Road Foreman Brings Sign Vandal to Punishment

Highway District Eight, with headquarters in San Bernardino County, has declared an open season on sportsmen who, rather than tramp the great outdoors in search of wild game, sit in the comfortable seats of their automobiles and fire upon automobile club road signs. This was evidenced during the month of October, when maintenance foreman Granville Harp came upon a person thus engaged.

It happened near Van Doran's Service Station, about five miles east of Newberry. Mr. Harp caught a party of three men parked by the side of the highway and shooting across the road at one of the official road signs of the Automobile Club of Southern California. "They responded angrily when I warned them," said Mr. Harp, "and boasted of the right to do as they pleased on the highway. When I told them they would have to pay for the damage they had done, they took flight in their automobile before I could acquire information for their arrest."

Mr. Harp started pursuit in a Ford truck. At Newberry he changed to his own private car and overtook the fugitives before they were released by the Agricultural Quarantine Station at Daggett. Here they were placed under arrest. One of the men pleaded guilty before Justice of Peace Van Dyke of Daggett, and was fined \$20 for the offense.

Big Slide Removed

Maintenance in District I has for the principal item of its work in December the removal of slides. The largest single slide of the season has been about 8000 cubic yards near the southerly end of the Klamath River bridge.

Associated Press Dispatch as Published in the
San Francisco Examiner.

'MEEK' KIDDIES BELIE NAME; TWO DISRUPT CABINET MEET

SACRAMENTO, Nov. 21.—(AP)—Two small curly-headed children all but broke up a peaceful session of Governor C. C. Young's executive cabinet here tonight.

The children were Bert and Laura Marie, 5½ and 4½ years old, respectively, son and daughter of Bert B. Meek, director of public works.

Everybody, including the governor and six other directors, several state officials and visitors, were sitting attentively listening to Meek when the quietness of the meeting was broken as a small curly-headed boy, carrying a toy rabbit, burst into the room and loudly informed his daddy "to hurry up."

Meek hurried, after first quieting the lad, but before he could finish his daughter came in and made known her wants. Meek then rushed to a close.



"Little" Bert and Laura Marie, whose joint job it is to direct the Director.

Mono County Wants Roads Kept Open Into Snow Sports Sections

Much enthusiasm is manifested throughout Owens Valley in preparations for winter sports in the foothills of the high Sierras and committees appointed by the several chambers of commerce throughout the valley are busily engaged with preparation of skiing, coasting and skating grounds. Inquiries from the southland indicate a growing interest and a request will be made for cooperation of the Division of Highways in keeping the snow-clad portions of the state highway open between Bishop and Long Valley, distance 28 miles.

Autoist Fined for Recklessness Toward Highway Workers

The judiciary of California is helping to give to the maintenance men who work on the highway the protection that they deserve by prosecuting those who negligently or carelessly endanger the lives of the workmen.

As an instance of this, Mr. A. Barker, a maintenance employee, was engaged in patching the highway about one-half mile north of Chualar on October 14, 1927, when a Chevrolet touring car, going north, driven by a Glendale resident in a reckless manner, almost hit Mr. Barker. The driver did not stop, but Mr. Barker secured a ride and followed him into Salinas, where he had him arrested. The judge imposed a fine of ten dollars.

"Slow" to be Painted on State Highways at Approach to Schools

The following order, intended to increase the factor of safety on highways near schools, has been issued to all district engineers by R. M. Morton, State Highway Engineer:

"A determined effort is being made throughout the state to reduce the traffic accidents involving children of school age. Both automobile clubs and various civic bodies are spending considerable sums of money each year in the education of school children to the dangers of modern traffic. A program of visual education is being conducted in 1218 cities in the forty-five northern and central counties depicting the major traffic hazards encountered by children proceeding to and from school.

"The Motor Vehicle Department is cooperating to the extent of having their men super-

Contented Trees is Boast of Stanislaus; Here is the Proof

Here is a visible and typical demonstration of what four years in California will do. The accompanying picture is a European sycamore, one of the group of trees planted in 1923



One of row of trees on state highway near Turlock

along the state highway north and south of Turlock, by the Chamber of Commerce of that city. They were cared for by State Highway Maintenance Foreman L. P. Laird of Modesto. The State Highway Commission and the Department of Public Works is now urging the importance of securing wider rights of way for highways in order that the

necessity may never arise whereby highway trees must be sacrificed to provide adequate traffic lanes.

In this connection it is interesting to note that the California Highway Commission has taken over or planted 60,000 trees during the past eight years and has acquired more than three times that number with rights of way, in addition to the forests through which the highways have rights of way 600 feet in width.

wise the use of highways by children attending rural schools fronting on highways.

"The Division of Highways' cooperation in this movement involves the painting of the words 'School—Slow' on the highways fronting these schools.

"Please arrange to have these signs painted at your earliest opportunity on all pavements fronting schools within your district, advising this office when the work has been completed."

A gasoline shortage is predicted for the year 2000, but by that time the cars will be so thick they can't move anyhow, so it doesn't matter.—St. Paul Pioneer-Press.

Mr. Spendix—"Any installments due today?"

Mrs. Spendix—"No, dear, I think not."

Mr. Spendix—"Any payments due on the house, the radio, the furniture, the rugs, or the books?"

Mrs. Spendix—"No."

Mr. Spendix—"Then I have ten dollars we don't need. What do you say if we buy a new car?"

The New Lake Almanor Causeway

IN 1925 the Great Western Power Company decided to raise the dam at their reservoir, Lake Almanor, in Plumas County. The road from Red Bluff to Susanville crossed the bed of the proposed enlarged lake about ten miles above the dam site, and the enlarged lake would flood the country for a distance of more than four miles north of the road. The state highway location crossed the proposed lake close to the site of the existing road, at a point where, in view of the ultimate enlargement of the lake, the distance across this body of water would be the shortest. At the time of starting work on the enlargement of the reservoir, the power company suggested that the state highway be routed around the northerly end of the lake, but as this would have lengthened the road over four miles, it was decided that it was not feasible.

COOPERATIVE PROJECT

In addition to flooding the road, the enlargement of the lake would also submerge the main line of the Red River Lumber Company's railroad. In order to preserve both the road and the railroad company's main line, an arrangement was entered into at the time work started on the enlargement of the lake, between the power company, the lumber company and the State Highway Commission, to construct a causeway across the lake. Numerous schemes were investigated, including a concrete pile trestle, concrete crib construction filled with rock, and protected embankments. Comparative estimates of cost of the various types indicated that the embankment would be the most economical construction, and tests on the materials which would be borrowed from alongside to construct the embankment indicated that the steepest slope on which the material could be expected to stand in its submerged condition, without the aid of protection, would be a 3 : 1 slope.

DIVIDE MAINTENANCE

The lake is subjected to heavy winds during the winter time, from the south, and it was, therefore, decided that this side of the embankment must be protected from wave action. The northerly side, being subjected only to very light wave action, on account of the comparatively short reach of water on that side and the infrequency and lightness of winds from the north, might be constructed of the natural gravelly soil, on a 3:1 slope and left unprotected. This arrangement was made, since the Red River Lumber Company's engineers believed that it would be safe and the maintenance quite light, and the agreement was accordingly drawn up so that they would maintain that side of the embankment. As finally adopted, therefore, the cross-section of the embankment consists of a 2:1 slope protected with massive, heavy rock on the south side, and an unprotected gravel slope of 3:1 slope on the north side, and a roadway of 42 feet in width between shoulders.



Lake Almanor Causeway.

18 feet of which is occupied by the railroad and 24 feet by the highway. A standard state highway guard rail was provided along the northerly shoulder and a 5-foot steel fence between the railroad and the highway roadbeds.

7000 FEET LONG

The work started on the construction of the embankment in the fall of 1926 and the embankment was completed shortly after the first of the year 1927. The embankment is 7000 feet long and has a depth of 35 feet at the lowest point, near the easterly end, tapering out to the ground level at each end. It contains about 500,000 cubic yards of material.

UNUSUAL CONSTRUCTION PLAN

A rather unusual method of constructing
(Continued on page 30.)

Senator Oddie Urges That More Federal Aid Be Given by U. S. to Roads of States

SENATOR ODDIE (Republican), Nevada, speaking, November 11, at the dedication of the new Market street bridge at Wilmington, Delaware, discussed federal aid of road building, and said that the government is under an obligation to continue the program mapped out in the law of 1916. This program, he said, calls for annual federal appropriations of \$75,000,000 for federal aid and an additional \$7,500,000 to be spent on roads in national forests.

EXPANSION PROPOSED

Amendments to the present Federal Highway Act were suggested by Senator Oddie in the following respects:

To provide for a higher percentage of the cost of building roads in sparsely settled areas, to be paid by the federal government.

To eliminate the present limit of \$15,000 per mile upon federal payments for roads built jointly with the states.

Increase in federal appropriations to provide connecting links in the national road system; and

Elimination of private billboards, sign boards, and other roadside advertising along the national highways.

The road building program is of importance, he said, not only to the west, where there is great need for improved roads, but also to the eastern states, which, he predicted, will soon be face to face with the necessity of widening many of their principal roads and constructing many new highways to handle increasingly congested traffic.

Senator Oddie's speech, in part, was as follows:

Our modern highway system comprises approximately 3,000,000 miles, of which 450,000 miles have some form of surfacing. The value of the country's 22,000,000 motor vehicles, including the value of the highways, is \$26,500,000,000. The sum nearly equals that of our 250,000 miles of steam railroads and 50,000 miles of electric railroads, which, with their equipment, are valued at about \$27,000,000,000.

About 4,000,000 automotive vehicles were produced in the country in 1926, of a wholesale value of over \$4,000,000,000, which gave employment to 3,500,000 people. The annual operating cost of the country's highway expenditures are about \$10,000,000,000, which makes its yearly cost of motor transportation about \$11,000,000,000.

It is interesting to note that while the states built about 14,000 miles of new surfaced roads in 1926, the

automobile manufacturers during the same period built 16,000 miles of automobiles, allowing 20 feet to the car.

AID TO BUILD CUMBERLAND PIKE

In 1803, congress planned the Cumberland pike, running from Cumberland, Md., to Vandalia, Ill. A few years later it authorized the construction of this road with federal funds, at a cost of \$8,000,000.

In 1916 the federal government declared its policy of "aiding" the states in building a system of highways of national importance, and in 1921 the Federal Aid Highway Law was enacted, which provided that federal funds be allotted to the states to aid them in the building of roads, and that the Secretary of Agriculture give preference to such state road projects as will expedite the completion of an adequate and connected system of highways, interstate in character.

Under this law the states have designated a system of highways, not exceeding 7 per cent of their total highway mileage, and all of the federal apportionments must be spent on this system. The 7 per cent federal aid system is therefore limited to about 210,000 miles, of which 76,708 miles have been improved or are in process of improvement with federal aid, and an equal amount has been improved on this system without federal aid.

Today two-thirds of this system is in some state of improvement; the states having expended over \$2,000,000,000, while the federal government has expended about \$580,000,000, being nearly one-quarter of the cost, instead of one-half as originally contemplated in the law.

The federal government has collected in war excise taxes directly from motorists close to \$1,000,000,000. So from a bookkeeping standpoint it is nearly \$500,000,000 ahead, after deducting its expenditures on the federal aid highway system.

SYSTEM LAID OUT

When the Federal Aid Highway Act was passed the system of national highways was laid out, and the federal government agreed to aid the states in improving them. The states accepted the offer in good faith and sincerity and look to the federal government to continue its cooperation until all the roads on the system are improved to meet traffic needs.

The federal government incurred this obligation and committed itself to a policy which it must carry out. It must fulfill its obligation to the states and keep faith with them on this most important work.

The federal appropriations for the years 1928 and 1929 of \$75,000,000 annually to be spent on the roads of the states in the federal aid highway system and \$7,500,000 annually on roads in our national forests are most reasonable and necessary.

At least this much must be authorized for appropriation in the coming session of congress for carrying on this work during the years 1930 and 1931. A reduction in these appropriations will seriously handicap the states in carrying out their road-building programs and destroy their confidence in the promises of the federal government.

Very briefly, the federal aid system, when completed, will include every city and town in the country,

These Figures Reveal Interest of California In Federal Road Policies

FEDERAL AID TO STATE HIGHWAYS (December 1, 1927)

Projects completed or under contract—	Miles	Actual or estimated cost	Federal aid received or applied for
Agreements execut'd	1512.5	\$46,658,229	\$20,935,496
Projects under construction; federal aid applied for—			
Agreement not yet executed -----	68.6	3,418,854	1,585,274
Totals -----	1581.1	\$50,077,083	\$22,520,770

On the above basis money received from the Government alone would build 711 miles of road.

The basis of distribution of federal aid money among the states is as follows:

One-third in the ratio which the area of each state bears to the total area of all the states.

One-third in the ratio which the population of each state bears to the total population of all the states, as shown by the latest available federal census.

One-third in the ratio which the mileage of rural delivery routes and star routes in each state bears to the total mileage of rural delivery routes and star routes in all the states, at the close of the next preceding fiscal year, as shown by the certificate of the Postmaster General, which he is directed to make and furnish annually to the Secretary of Agriculture.

FOREST FUNDS (December 1, 1927)

Projects on State Highway System,

Projects constructed or advertised:

Miles -----	210.8
Estimated total cost -----	\$6,394,324
State cooperation -----	\$1,388,000
County or local cooperation -----	\$373,713
Miles -----	210.8

This leaves \$4,632,611 expended or obligated forest funds on the state system which alone would build 152.7 miles.

The basis of distribution of forest funds is as follows:

One-half in the ratio that the area of national forest

land in any state bears to the total area of such land in all states.

One-half in the ratio that the value of national forest land in any state bears to the total value of such land in all states.

AMOUNT OF FEDERAL AID.

The amount of federal aid on any project shall not exceed 50 per cent of the total estimated cost of the project or exceed \$15,000 per mile, exclusive of bridges over 20 feet span, except that in the case of any state containing unappropriated public lands exceeding 5 per cent of the total area of all lands in the state, an increased percentage equal to one-half of the percentage which the area of unappropriated public lands in such state bears to the total area of such state, shall be added.

The following table shows the states profiting by this rule:

	Ratio of the area of unappropriated land plus nontaxable Indian land to the total land area of the state.	Percentage payable by the federal government	Maximum federal aid payment on basis of \$15,000 per mile
Arizona -----	0.4469	72.34	\$21,702 00
California -----	0.2010	60.05	18,015 00
Colorado -----	0.1215	56.08	16,824 00
Idaho -----	0.1949	59.75	17,925 00
Montana -----	0.1292	56.46	16,938 00
Nevada -----	0.7543	87.72	26,316 00
New Mexico -----	0.2686	63.43	19,029 00
North Dakota -----	0.3656	68.28	20,484 00
Oklahoma -----	0.1093	55.47	16,641 00
Oregon -----	0.2451	62.25	18,675 00
South Dakota -----	0.1123	55.62	16,686 00
Utah -----	0.5779	78.90	23,670 00
Washington -----	0.0875	54.38	16,314 00
Wyoming -----	0.2840	64.20	19,260 00

of 5000 inhabitants, and will pass within ten miles of 90 per cent of the population of the country. It is a plan of national highway unification, with local state control.

The road projects under this system are initiated, supervised and constructed by the states, with such federal participation as will insure continuity and articulation of the system.

NATIONAL ROAD NEEDS

A few of the national needs for the federal aid highway system should be mentioned briefly:

Good roads over which the Postal Service can carry the mails.

Good roads which promote commerce among the states.

Military highways for national defense.

To extend farm markets by improved roads and the use of motor equipment, which have enabled the farmers of the country to quadruple the economic range in their choice of markets.

To increase the efficiency and production of our country and the national wealth, and to eliminate enormous national waste.

In the public land states of the west, the federal government owns from a small percentage to nearly 90 per cent of all the land in the states. The law provides that the federal government shall increase its contribution to the cost of building and improvement of the highways above one-half, in proportion to the government's ownership of lands in these states.

A brief statement regarding the roads in the national forests and the necessity for them should be of interest. They comprise 160,000,000 acres of federal owned land in thirty-three states and in Alaska and Porto Rico, and contain about 600,000,000 feet of standing timber. The value of the timber, grazing and water power in these forests is estimated at about \$1,500,000,000, with other resources having a value of about \$500,000,000.

An adequate system of roads and trails is absolutely essential for the proper administration, protection and utilization of the federal land and resources within the national forests, for fire protection especially, and also for the protection of the nation's watersheds.

EASTERN ROADS IMPROVED

In the wealthier, more populous east, road improvement is much farther advanced, and easterners mistakenly suppose highway expenditures may shortly be reduced. The day of such reduction is as remote as the elusive saturation point in motor vehicle production and registration.

The growing traffic demands the constant improvement of highway facilities, the replacement of outworn surfaces, widening and strengthening of pavements and rights of way, the reduction of grades established according to less exacting standards of a few years ago, the elimination of railroad grade crossings, and the separation of grades at important highway inter-

(Continued on page 41.)

Some "Barks" from State Press Regarding "Hot Dog" Stands

"HOT DOG" stands, wider rights of way, and a discussion of the scenic values of highways have predominated in the highway news published in the newspapers of California during November.

The outburst of publicity dealing with these subjects followed public statements made by B. B. Meek, Director of Public Works, and members of the Commission pointing out the necessity for wider rights of way to protect highways against disfigurement by "hot dog" stands and unsightly shacks, and at the same time to assure the preservation to the highways of beaches, and group trees, or other places of unusual beauty adjoining the roads.

The press as a whole has given a loud and approving "bark" to the protest against the "hot dog" menace. Thus the *El Centro Press* expresses itself:

Glory be to the California Highway Commission in its promised warfare against California's black eye, the hot dog stand.

And included in the term "hot dog stand" are "Dad's Shack," "Pete's Place," "The Coffee Pot," "Bubbling Kettle" and all the rest of the thousand and one places bearing names designed to catch the eye and the dime of the passing tourist, but in reality doing nothing more than to mar the natural beauty of which Californians boast.

Time was when there was considerable pleasure in traveling along the main highways, and there still is, but it is marred every step of the way by tumble-down or even highly artistic shacks offering all sorts of edibles and drinkables but emphasizing chiefly—the hot dog.

We have nothing personal against the hot dog. We have eaten many of them and hope to eat more of them. But we do not believe that it is necessary to blot out the landscape and the beauties of nature with a lot of moronish signs just to tempt the appetites of those of us who do like hot dogs.

Some time ago the large oil companies and other leading firms in California awoke to a realization of just how inharmonious their signs along the highway were, and these signs in many instances were works of art compared to those that now greet the eye. These firms dispensed with their signs—an act that cost them no little sum.

But for every sign of this sort there are hundreds of these little mongrel signs. They are neither humorous, catchy, or inviting to look at—and we venture to say they are not such howling successes as business getters.

Away with the whole blooming mess of them! The state has protected nature by passing a law against painting signs on rocks as the idiots used to do some years back. It should at least show the same amount of compassion on one of the noblest works of nature—the human eye—and protect it from this epidemic of

jazzomania that affronts "El Camino Real" and all the lesser "reals."

The *Salinas Index* also gives its editorial approval. Says that paper:

The ultimatum of Bert B. Meek, director of the state department of public works, issued in San Luis Obispo a few nights ago, to the effect that the ever-present "hot dog stands" along the state highway must eventually go, cannot fail to extract a sigh of relief from many who run across these entirely unnecessary and unsightly things at every turn in the road these days. At some points they have attained the dignity of "barbecue sandwich shops," and are generally run in connection with an oil and gas service station. The atmosphere about them is polluted with enough greasy smells to stifle one, and put the evils that befell Falstaff to shame.

There may have been a time when this type of eating place was desirable. That was back in the days of slow-moving "hawse an' wagon," or a man on horseback. But today, with the means of rapid transportation—the automobile and the airplane—there can be no reason for anyone starving to death before reaching the next town.

Down with hot dog stands, say we.

The *Palo Alto Times* suggests that the trading district along highways be zoned. Says that paper:

Purchase of state highway rights of way 100 feet or more wide to prevent scenic beauty from being hidden by hot dog stands and other disfiguring structures is to be the policy of the state in the future, according to Bert Meek, director of public works for California.

We who live on the peninsula where hot dog stands, eating "shacks," fruit vending booths and the like strung along both sides of our highway have destroyed much of the earlier charm of our regional landscape, can appreciate the importance of this newly declared state policy. While it may not be practicable to secure such protective rights of way along all the highways already built, the underlying motive of the state which has prompted the enunciation of this policy has much to commend it. People who go motor-ing into the suburban or rural regions do so to get a glimpse of real outdoors. If they merely want to view a succession of trading places, they would do better to stay in the cities and drive around the shopping districts where more numerous and much more imposing shops are to be found.

Clearing the landscape along the highways of bill-boards is only part of the work needed to be performed in the landscape rescue program. The hot dog stands are a symbol of another distinct menace.

But if such trading places must be provided along the highways, some restrictive arrangement should be devised, a zoning system, for example, which would permit such places to be operated only at specified mileage intervals. Such an arrangement would be a great boon to the beautification movement on the

peninsula. But we do not mean to infer by that remark that the menace complained of is peculiar to this region. Wherever there are highways—and scenery—disfiguring structures tend to bob up alongside them with mushroom-like quickness and weed-like multiplicity.

It is interesting in this connection to note what the *Highway Engineer and Contractor* has to say on this subject in an article entitled "Highways of the Future." We quote from that magazine as follows:

"Hot dog" stands and gasoline stations at the roadside will be replaced by respectable road houses set well back from the highway in a grove of trees.

Road shoulders and ditches will be covered with grass and the roadside beautified with irregular trees not planted like telephone poles.

Here are some of the other developments from the future that the same magazine makes in the article referred to:

Roads may be considered in terms of the number of people and amount of goods hauled rather than width, length and character of surface.

Air rights over railroads will be used as elevated highways operated as toll roads, or in rural sections a parallel right of way will be used.

Congested sections of cities will have double-decked streets with street cars below the ground and bus lines operated on track-free streets at ground level.

Grades will be separated at congested highway crossings, thereby increasing by 50 per cent or more the road capacities at peak loads.

Country highways near cities will have a sidewalk on one side.

Motorists Responsible For Grade Accidents; U. S. Court Says So

The "Stop! Look! Listen!" signs at railroad grade crossings take on new significance through a recent ruling of the United States Supreme Court, says the *Literary Digest*. The public, we are reminded by the *New York Times*, "has been accustomed to throw the blame for all grade-crossing accidents on the railroads." But the Supreme Court, in a decision handed down by Associate Justice Holmes, holds that motorists, not railroad companies, are responsible for their own safety when crossing railroad tracks. The case, which was carried to our highest tribunal, was that of an Ohio automobile truck driver who approached a railroad crossing at five miles an hour, and was killed by a train going at the rate of sixty. His widow testified and the lower courts held that this driver had taken all the precautions required of him; the Supreme Court holds otherwise. Said Mr. Justice Holmes, in his ruling:

When a man goes upon a railroad track, he knows that he goes to a place where he will be killed if a train comes upon him before he is clear of the track.

ROUGH GOING

Ode to the Horse

O horse, you are a wonderful thing;
No buttons to push, no clutch to slip,
No sparks to miss, no gears to strip,
No license-buying every year.
No plates to screw on front and rear,
No gas bill climbing up each day,
Stealing the joy of life away.
No speed cop chugging in your rear,
Yelling summons in your ear.
Your inner tubes are all O. K.
And, thank the Lord, they stay that way.
Your spark plugs never miss and fuss,
Your motor never makes us cuss.
Your frame is good for many a mile,
Your body never changes style.
Your wants are few and easy met,
You've something on the flivver yet.

—Gouvernelt (N. Y.) Free Press.

Said the flapper, after she had introduced her boy friend to her parents: "What side of the family do you think I take after?"

"Well, you have your father's eyes, nose and mouth," said the boy friend, "but you get your legs from your mother."—*Country Gentleman*.

A resident of Atlanta took out an accident insurance policy and then fell ill with pleurisy. Later he tried to collect from the insurance company but they refused a settlement. The man sued and in the municipal court it was ruled that pleurisy was not an accident but a visitation of God.

The superior court, however, reversed the decision on the ground that a visitation of God to a resident of Atlanta was an accident.

Si—"Sara, is there anything you want from town this mornin'?"

Sara—"You might stop in at one of them there stores and buy a jar of that there Traffic Jam I been ahearin' so much about."

"How long you in jail fo', Mose?"

"Two weeks."

"What am de cha'ge?"

"No cha'ge; everything am free."

"Ah mean, what has you did?"

"Done shot my wife."

"You all killed yo' wife and only in jail fo' two weeks?"

"Dat's all—then I gits hung."

"Work faithfully for eight hours a day and

Don't worry.

Then, in time, you may

Become the Boss, and

Work twelve hours a day

And have ALL THE WORRY."

He knows that he must stop for the train; not the train for him.

In such circumstances, it seems to us that if a driver can not be sure otherwise wherever a train is dangerously near, he must stop and get out of his vehicle, although obviously he will not often be required to do more than stop and look. It seems to us that if he relies upon not hearing the train, or upon any signal, and takes no further precaution, he does so at his own risk.

Making Highways Fool Proof; Object Lesson From San Diego



The old Del Mar grade crossing in San Diego County was a menace to the traveling public.

This motorist beat the locomotive to the crossing. When such races are ties we read about them in the papers.



Now we have a separation of grades at the crossing. It is safe for the motorist, and—



The train engineer can approach Del Mar without danger of heart failure.



Another step toward safer highways was taken recently when the Del Mar line change with its new overhead crossing of the Santa Fe tracks, and new twenty-foot pavement, was opened to traffic.

The new stretch of highway eliminates a very dangerous grade crossing, two sharp right angle curves, and a long stretch of fifteen-foot pavement. It speeds up travel and adds to its safety.

MOUNTAIN HIGHWAYS

(Continued from page 2)

present roads thus improved can be built at a cost that they can be scrapped at a later time; the use to which they have been put will show, even with their abandonment, a very considerable balance on the credit side of the ledger.

At a time when roads in California were built out of bond moneys and future generations thus obligated to pay for them, there may have been a reason why "permanent" location and the ability to build a "permanent" type of road may properly have been considered prerequisite to any construction. Today, however, we are out from under that obligation. We are building our roads on "pay-as-you-go" plan, and the people who are footing the highway bills should be entitled to road service within their lifetime.

Do not mistake me as advocating makeshift mountain roads. On the contrary I advocate that the most careful study be given of the final location of our mountain highways to the end that every advantage be taken of every feature, scenic and otherwise, that will lure more and more people out into the mountain areas of California. But I also believe that we can build or improve many miles of useable, travelable, and low cost roads into these mountains that will serve the people now living, while the "perfect" road is being built.

The roads through Europe's mountain passes have taken centuries to build. Ours can not be built in a day. I can not escape the thought, however, that here in California the improvement of our mountain roads has been unduly delayed through the mistaken thought that little work should be done on a road until the final and perfect highway can be built.

WHOLE STATE INTERESTED

And in conclusion, let me voice the opinion that every resident of California has a very great and a very immediate interest in the construction of these mountain highways.

Just as the mountain passes of Europe are the magnet that attract wealth from the entire world to Europe, so California's mountain areas can be made the means of bringing millions of "outside" money into California, money shared and distributed to residents of the cities and valleys in even larger measure than to our mountain peoples.

But this is only part of the story. There is rest, recreation, strength and inspiration in the mountains for our own people.

If in doubt, plan next summer to become better acquainted with California's mountains.

Policy Will Be to Give Publicity to Convict Camps, but not Personal Publicity to Convicts

REGULATIONS governing the conduct of prison camps on the state highway system have been announced by B. B. Meek, Director of the Department of Public Works.

The high points of the new plan are:

First, complete official publicity regarding the conduct of convict camps, but an elimination of publicity regarding personal activities of the prisoners. It is believed that turning the spotlight too much upon the prisoners tends to disturb camp discipline, and to imbue an attitude of hero-worship both on the part of the prisoners toward themselves and on the part of the public toward them.

"The convicts are in these road camps discharging a debt to the state," Director Meek states, "and it is healthful for them to realize that the obligation is on their part toward the state, rather than on the part of the state toward them. The men in the road camps are being given an opportunity denied to many other prisoners, and there should be no confusion in their minds on this score."

Second, an effort is being made to increase by a substantial sum the amount of money saved by the prisoners during their employment in the convict camps. Mr. Meek, who was for many years a member of the State Board of Prison Directors, believes that one of the most effective means of rehabilitating prisoners and restoring them to useful status is to increase the amount of money in their possession when they enter free life. Money on hand to tide them through the readjustment period following their release from imprisonment either in the penitentiary or the road camps is the best safeguard against temptation to again commit crime, he declares. Net earnings, after deduction of expenses of the prisoners in road camps, is the figure that Mr. Meek seeks to materially increase.

In this connection it is worthy of note that Director Meek, while representing Butte County in the Assembly in 1915, introduced the bill, later passed by the legislature, under which California began and continued its convict camp work for many years. Governor Young was speaker of the Assembly at this same session, and aided in the passage of the bill. Under the Meek bill, prisoners were given one day's credit on their sentence for

two day's work on the road. This bill remained unchanged until 1923, when the legislature supplemented it by providing that the prisoners should be paid, in addition to the credits on their terms, a gross of \$2.10 a day. From this gross there is deducted the cost of meals, kitchen help, freight on supplies, fuel, lighting, refrigeration, depreciation on cook house equipment, salaries of commissary men and clerks who work on convict records, camp physician, barber, shoemaker, guards, office rent, phones, telegrams, stationery, accident insurance for free employees, commissary supplies, including bedding, tobacco and toilet articles; cost of camp maintenance, transportation to and from prisons, rewards for escaped prisoners who have been recaptured and the expense of returning such escapes to prison.

An effort is being made to decrease administration expenses, and to increase the interest of the convicts in the more thrifty and economical use of camp supplies.

The location for prison camps is also being most carefully studied to the end that the camps be established in places where the work will be a maximum duration, thus again reducing costs charged to the convicts.

"It is difficult to say what can be accomplished in advance of actual accomplishment," Mr. Meek states. "However, we are earnestly trying to save money to the convicts, believing that actual 'pants-money' is the best safeguard against temptation when they enter free life.

"We are trying to guard them against any feeling of hero-worship either by themselves toward themselves or on the part of the public toward them. We do not want them to be 'sob-sistered' into any condition of self-pity.

"We want them to have the full value of the discipline that their offenses have merited, together with an appreciation of the fact that they are being given an opportunity to reenter free life on more advantageous terms than their fellows in prison.

"And I believe this reflects the desire of most of the men in camps themselves. They appreciate the opportunity to enter the road camps, but prefer to be left quietly there to work out the problems that they must face before their reentry into free life."

COMMUNICATED

China Asks Road Aid From California; Plans 7000 Miles of Highway

DEPARTMENT OF HIGHWAYS
OF KWONG TUNG PROVINCE.

Canton, Kwong Tung, China,

October 27, 1927.

To the Commissioner,
California Highway Department,
Sacramento, California.

GREETINGS:

May we take this opportunity to relate to you that the Province of Kwong Tung is at present undertaking a very heavy program of road construction work. We have already laid out tentatively some seven thousand miles of road connecting various cities of importance and have been working, since the organization of this Department some three years ago, with the hope to complete the entire system in six or seven years. Since then the construction of a good part of the whole system had been completed and a good part is now under construction. A good many miles have been surveyed but on account of inefficient funds construction has not yet begun.

In order to carry out our financing and construction program, we have devised many methods. Some of them we have found practicable and some not. We are therefore still looking forward for further methods in order to hasten on the completion of the work of our program.

We have no doubt that your Commission, with riper experience, should have many good and practicable methods to carry out the different stages of road construction work. We shall, therefore, be most grateful if you would supply us information on the following subjects:

1. Method of highway finance.
2. Organization of the Highway Commission, including the executive and engineering staff.
3. Field survey methods.
4. System of accounting and cost keeping.
5. System of storekeeping.
6. Traffic rules and regulations.
7. Any other information that you believe of value to us.

If you have the above information bound up in pamphlet form and if you have any other regular publication pertaining to highway work, we shall be most grateful if you send them to us. If there is any cost in connection with the sending of the pamphlets, please inform us and we will reimburse you whatever expense incurred.

Allowing us in closing to extend to you our courtesies and to thank you in advance for the favor rendered.

Yours respectfully,

H. S. CHUCK, Commissioner,
Department of Highways of Kwong Tung.

[Complete information upon the matters requested was forwarded to Mr. Chuck by E. Forrest Mitchell, secretary of the California Highway Commission.]

Magazines for Prison Camps Are Requested

Sacramento, California, November 25, 1927.

EDITOR CALIFORNIA HIGHWAYS AND
PUBLIC WORKS:

The several superintendents of our prison camps report that they could use a good many more magazines in their reading rooms at the camps, and have suggested that the many employees of the Division of Highways contribute their used magazines for this purpose.

The prison camp management is heartily in accord with this suggestion and if these magazines could be left in the office of the secretary, the camp management will see that they are transported to the camps.

Yours very truly,

E. FORREST MITCHELL, Secretary,
Department of Public Works,
Division of Highways,
By J. P. H., Deputy Secretary.

Sanitary Condition of Camps Wins Praise

STATE COMMISSION OF
IMMIGRATION AND HOUSING
OF CALIFORNIA
State Building

Polk and McAllister Streets

SAN FRANCISCO, November 29, 1927.

State Highway Commission,
Sacramento, Cal.

GENTLEMEN:

On November 28th, our camp inspector, Mr. F. J. Rugg, inspected your Sullivan camp, located at Ridge Route, Los Angeles County. From our inspector's report it appears that this camp is in a good sanitary condition and adequate housing provided.

We wish to thank you for your interest and cooperation in the matter of camp sanitation.

Very truly yours,

E. A. BROWN,
Director of Camp Sanitation.

Courtesy of State Highway Workers Wins Letter of Appreciation

ELECTRICAL WEST
883 Mission Street
San Francisco

Editorial Rooms

November 30, 1927.

Mr. T. A. Bedford, Division Engineer,
California Highway Commission,
Willits, California.

Dear Sir:

This belated acknowledgment of courtesies received at the hands of members of your division should have been written last August but has been delayed on account of an accumulation of work.

Very late in July my husband and I were returning from Oregon by automobile. Just across the bridge over the Smith River at the foot of the convict camp, ten miles from Crescent City, our car broke down and a member of your organization, whose name we did not get but who was very kind in trying to assist us, was unable to remedy the trouble but suggested that perhaps Mr. Forbes at the convict camp might be able to tell us what the trouble was. My husband acted on this suggestion and Mr. Forbes was not only very courteous in trying to help us start the car but he was also very helpful in assisting my husband to communicate with the Automobile Association at Crescent City to arrange for tow service.

Later, on the road between Crescent City and Eureka, we again encountered most courteous treatment from all members of the highway organization engaged then in controlling and directing traffic over a bad stretch of road where it was necessary to do much blasting of tree stumps, etc. We had the pleasure of taking with us, in the lead car, the man with the red flag, who told us something of the work that was being done and whom we found a most agreeable companion and whose caution in regard to making a safe passage for the cars we thoroughly approved of. We also had the pleasure of talking with the inspector at the end of the first control who gave us an idea of the number of cars passing over the road and the care that was exercised to give them safe passage.

My husband and I felt that the work was being handled in a most efficient manner and that much credit was due the entire organization. We are both glad to have had the experience of learning at first hand something of the difficulties of highway construction work, which too often is taken entirely for granted, and it is with real pleasure that I express our appreciation.

Yours very truly,

ETHEL J. KNOWLTON,

News Editor.

ALONG THE CONCRETE

This from the menu of a fish cafe along the road:
Most any old fish can float, and drift along and dream,
But it takes a regular live one, to swim against the stream.

Just as you enter the sand hills between El Centro and Yuma a flaring sign announces: "This is Peg Leg's Los Angeles Dry Dock; Latest and Biggest Subdivision."

And, of course, without referring to Peg Leg, let us add that there is "some windjammer" parked in that dry dock.

There is at least one highway sign that justifies itself. It reads:

BOOST CALIFORNIA-MADE
MERCHANDISE THE SAME
AS YOU BOOST THE CLIMATE

"Let's swap smiles," reads the invitation of a roadside fruitery. Needless to say that the sign is "bearing fruit."

"Extraordinary" Number of Requests for Railroad Road Grade Crossings

The grade crossing situation as seen by the State Railroad Commission is discussed in a letter of transmittal to Governor Young of the annual report of the Railroad Commission for the fiscal year of 1926-27. This letter says:

The Commission kept up its efforts for the elimination, or separation of dangerous grade crossings by authorizing 21 grade separations. The reconstruction of an old overhead crossing with impaired clearances was denied. The Commission also granted 12 extensions of time in which to construct grade separations, and issued a number of orders amending or revising previous orders of this nature.

Although the commercial and industrial development of California has resulted in the filing of an extraordinary number of applications for grade crossings by railroad lines, spur tracks, industrial tracks, or other tracks, the Commission has investigated every application with scrupulous care, and has denied, dismissed, or ordered revised many applications, in order that the public safety may be conserved, and the needs of industry may not be infringed upon.

A survey of grade crossing separation possibilities was completed in the city of Palo Alto, and partially completed for the town of Sunnyvale.

GRADE CROSSING PROTECTION

During the last fiscal year the Commission issued General Order No. 75, providing standards of grade crossing protection of a uniform nature, and also revised its General Order regulating clearances along railroads, one of the effects of which will be to do away with the hazard created by the continual increase in the sizes of freight cars and locomotives.

GRADE CROSSING SURVEYS

Surveys of grade crossings were made on Southern Pacific lines through San Jose, through the East Bay cities, except Berkeley (which was surveyed during the previous year), through Burlingame, and from Watsonville to Aptos on the Santa Cruz branch. A survey was also made of grade crossings through El Cerrito and Albany on The Atchison, Topeka and Santa Fe Railway line, and all crossings authorized by the Commission in Santa Clara and Merced counties were inspected to insure carrying out of the Commission's orders. An intensive study was also begun with respect to signal ringing circuits on the lines of Southern Pacific Company, The Atchison, Topeka and Santa Fe Railway Company, and the work was completed on the Santa Fe in Albany and Oakland.

The farmer and the lawmaker can both raise the value of their product by limiting output.—Christian Science Monitor.

So far, every photograph radioed from Europe looks as though it had encountered a rough crossing.—Arkansas Gazette.

Safety experts in Chicago estimate that we have twenty-five thousand deaths a year from accidents in the home. Despite this appalling record, foolhardy people still persist in loitering about the perilous place, and even children are sometimes found there.—The New Yorker.

"SURFACE TREATMENT" METHOD OF OILING ROADS

(Continued from page 13.)

thoroughly bladed and worked to secure a perfectly smooth surface of uniform texture prior to oiling.

To secure a good job by the penetration method it is essential that the surface be thoroughly sound and well compacted before oiling.

The first step, therefore, is the preparation of the base. If it has become rough and pitted under traffic, it is lightly scarified and trued up with a road grader, then sprinkled, dragged, and sometimes rolled, if there is too much loose material on the road.

When firm and smooth, the surface is thoroughly swept with a power broom supple-



Oiled road on the state highway in Orange County.

mented by a hand broom if necessary. All loose material and fines are removed and the rock in the surface is exposed.

The oil is then applied under pressure at the rate of one-quarter to three-tenths of a gallon per square yard and, when traffic can be detoured, allowed to penetrate without covering, the time required for penetration depending upon the texture of the surface and viscosity of the oil. Two or three days are usually sufficient.

CARING FOR TRAFFIC

It is usually necessary, however, to carry traffic through the work. In such cases the usual procedure is to oil one-half of the roadway at a time, handling traffic under control. Immediately after oiling one side, the oil is covered lightly with clean, dustless screenings, applied at a rate of from 50 to 150 cubic yards per mile of full width roadway, the

amount depending on the width, nature of material, traffic, etc.

As soon as the road is screened, traffic is diverted to the side just oiled and the opposite side then oiled and screened.

SUBSEQUENT TREATMENT

Following the first application of oil, the surface of the roadway is bladed and the oil-coated screenings are dragged into depressions in the road surface, in order that minor inequalities in the surface may be smoothed out. The oil collects in the minor depressions and furnishes sufficient cementing material to take up the screenings. Where large amounts of screenings are used and the traffic is carried through the oiling, the blade should be operated continuously until the oil has dried up or has been absorbed by the cover material. If necessary, imperfections in the surface are repaired with pre-mixed oil and mineral aggregate.

The second application of two-tenths to one-quarter of a gallon of oil per square yard is spread as before and, if possible, traffic kept off so as to allow for absorption. The road is then screened again before throwing open to traffic. High viscosity oils require more screenings than the thinner oils. Clean screenings only should be used, as fine material including dust absorbs the oil before it can penetrate the base, with the resulting formation of a thin oil mat on the surface, which lacks adhesion to the base and will not stand up under traffic.

APPLYING SCREENINGS

When traffic can be detoured entirely off the work, the screenings are not applied until after the second application of oil, as we have found by experience that the same results as regards smoothing up, correcting defects, etc., are secured by covering and dragging after the second application of oil as are secured by covering and dragging after each application and it is usually found possible to get by with materially less screenings when made in one application than in two with resultant lower cost.

ALTERNATE METHOD

An alternate method to the use of light oil for both applications is to use light fuel oil (60 to 70 per cent) on the first application in order to secure penetration and a heavy asphaltic road oil (90 to 95 per cent) on the second application. This process, however, requires a special heating plant for the heavy oil. In some cases emulsified heavy oil is being used, thus making it unnecessary to install a heating plant. The emulsified liquid contains 50 per cent of asphalt and 50 per cent of water, so that when the same amount of liquid per square yard is spread there is only one-half as much asphalt, the reduced quantity of asphalt thus at least partially offsetting the cost of emulsification. A number of miles have been oiled in California in this manner and the process is under close observation. The advantage to be gained by this process, if any, is the ability to spread light applications of heavy asphaltic oils without the use of expensive and troublesome heating equipment.

No recommendations can be formulated as yet relative to this special treatment method, though the results secured thus far have not been unsatisfactory.

PENETRATION

Maximum penetration of the oil into the compacted road surface should be one of the principal objectives. This penetration results in a gradual transition in

GOVERNOR YOUNG MOVES TO SAVE RECREATIONAL AREAS TO CALIFORNIA

(Continued from page 8.)

recreation are becoming scarcer and more valuable year by year. For instance, our beaches along the coast, which could have been easily acquired a few years ago, are now in private hands and in large measure shut off from the public. The same will soon be true of our redwood forests and similar natural resources, if prompt action is not taken toward their preservation.

A considerable number of state lovers, both in this state and in the east, have evinced a desire to lend financial aid toward preserving these beauty spots in California. Already redwood parks have been purchased for the state in this way, and intimation has been given that a great deal more may be expected along this line, provided the state will only cooperate. Accordingly, the last state legislature provided for submission to the voters a park bond issue of \$6,000,000, the bonds to be issued only as each dollar of state money is matched by another dollar from these outside sources. Thus, by this \$6,000,000 bond issue, California will be able to invest for future generations \$12,000,000 in a wisely coordinated comprehensive state park system.

The importance of this effort naturally demanded from me the best I could do in the selection of a Park Commission. It demanded that the Commission should be strictly nonpolitical, and should be composed of nature lovers as well as men of preeminent ability and business capacity. Finally, it demanded that they should be so well and favorably known that in their efforts they will inspire the entire confidence of all our citizens.

texture of the top one or two inches of the crust from the rather rich condition of the surface to the lean condition found at the maximum depth of penetration without any distinct binding plane or plane of separation which is unstable under traffic.

MAINTENANCE

After the surface oiling operations have been completed it is essential that thorough and incessant maintenance set in immediately. Scarred places should be thoroughly cleaned, broomed out by hand and swabbed with oil followed by a dash of screenings. Each scar, no matter how small, should be treated.

If it is not possible to immediately treat scarred places they will soon develop into pot holes. In such cases a premixture of oil and rock should be thoroughly tamped into the pot hole after cleaning it out thoroughly and swabbing it lightly with oil.

TRAFFIC

On heavily traveled roads, it is generally found necessary to carry traffic through the work. This is not an unmitigated evil, however, as the traffic passing over the oiled surface, especially over the first or primary coat, reveals any weak places, which can be immediately repaired.

When traffic is allowed through the work, however, the cars are liable to become spattered with oil and the irate motorist is inclined to severely criticize the Department. In order to reduce the criticism to a minimum, printed cards are handed each motorist as he approaches the work, warning him that the road is being oiled and requesting that he maintain a speed through the work of not to exceed five miles per hour.

Following is the personnel of the new Commission, with a short sketch of each, showing the special qualifications which led to his appointment:

WILLIAM E. COLBY, who for many years has been active as an officer of the Sierra Club, is one of the outstanding park workers in California. He was at one time associated with John Muir in the cause of conservation of natural scenery, particularly with reference to national parks. One of his most notable contributions toward parks is the recent enlargement of the Sequoia National Park, which was effected largely through his efforts. He has a national, as well as an international, relation to park and recreational movements, having been a vice president of the American Forestry Association, and of the American Alpine Club, as well as being one of the presidents d'honneur, International Congress l'Alpinism, held in Monaco in 1920, a trustee of the National Parks Association, and a councillor of the Save-the-Redwoods League. Mr. Colby's home is in Berkeley. He is a law lecturer at the University of California, and an attorney with offices in San Francisco, specializing in mining law.

DR. RAY LYMAN WILBUR, president of Leland Stanford Junior University, has taken an active part in park and conservation matters in California and in the nation. He was one of the original councillors of the Save-the-Redwoods League when it was founded in 1918. During the war he was Chief of the Conservation Division of the United States Food Administration. As a former president of the California Conference of Social Agencies and of the Council of Social and Health Agencies of San Francisco, and as president of one of our large universities, President Wilbur brings to the Park Commission a broad understanding of the recreational as well as the aesthetic phases of the park program in California.

HENRY W. O'MELVENY, an outstanding attorney of Los Angeles, who has practiced his profession in that city for over forty-six years. He is recognized as one of the leading advocates of parks and recreation centers in southern California, and is credited with possibly a more intimate knowledge of the park problems of that part of the state than is possessed by any other one man. He has served Los Angeles in many capacities, being chosen as City Park Commissioner in 1910. He is a great lover of the out-of-doors and is particularly interested in trees and botanical matters generally.

MAJOR FREDERICK RUSSELL BURNHAM, of Los Angeles, is an explorer of international note. His recently published book, "Scouting on Two Continents," tells of his picturesque and eventful career as cowboy, guide, miner and deputy sheriff in the west, and as Chief of Scouts of the British army in South Africa and explorer in French Nigeria and German East Africa. He has to his credit archaeological discoveries of the Maya civilization in Yucatan and the Yaqui country in Mexico. He was a friend of President Roosevelt, and has of late years been associated with John Hays Hammond in important engineering enterprises. He is an out-of-doors man par excellence, with an intimate knowledge of southern California, particularly of its mountains and desert regions.

EX-SENATOR W. F. CHANDLER, of Fresno, has to his credit a long career of service to the State of California as a public official. He served as a member of the assembly in 1900, 1904, 1906, 1910 and 1912, and as a senator in 1914 and 1916. He is particularly conversant with conditions in the interior valleys of the state where he has large agricultural interests. He is especially interested in archaeological explorations and

discoveries, as well as in the development of parks and other natural resources of California.

These five distinguished citizens of California, representing not only all portions of the state, but also many walks of life and diversified interests, serving as California's first State Park Commission, will have in their hands the important task of formulating a park policy for the state. Under their direction will be carried out the state park survey, authorized by the last legislature to determine what areas in the State of California are suitable and desirable as additions to our state park system. Upon them will devolve the task of administering the funds which will be provided for the acquisition of further state park properties if the voters act favorably upon the \$6,000,000 State Park bond issue, passed by the last legislature and appearing on the ballot for ratification by the voters in November, 1928.

THE NEW LAKE

ALMANOR CAUSEWAY

(Continued from page 19.)

the embankment was adopted, consisting of the use of Bucyrus drag lines which swung the material directly from the borrow pits into the embankment, where the separation was not too great. However, on the higher parts of the embankment, where the distance between toes of slopes was as much as 215 feet, it was necessary to handle the material as much as three times in order to deposit it in its final position. The equipment used was equipped with 70-foot booms, and could move the material about 130 feet at one lift, and on account of the depth of the borrow pits being limited by the height of the water table, which would not permit of excavation more than 20 feet in depth, it was necessary to start the borrow pits as much as 400 feet from the embankment and move the material two or three times successively in order to deposit it where it belonged. In spite of the double and triple movements of a large portion of the material, the cost was quite light, being less than \$0.19 per cubic yard for the completed embankment. The total cost of the completed project was something over \$200,000, of which the state paid the estimated cost of a ground level graded road, which it would have built across the lake bed had the water level not been raised by the power company, amounting to slightly less than \$15,000, while the remainder of the cost was divided between the power company and the railroad.

TO OPEN IN SPRING

The project was completed during the summer of 1927, and in order to connect it with the constructed highway which ended about a mile to the east of the lake, the state, during the past summer, constructed a connecting link, thus making usable for the public about 2.5 miles of constructed highway above the lake level, should the water from the lake rise this winter sufficiently to flood the existing road. For right of way reasons the project has not yet been opened to the public, but it is expected that these right of way matters will be ironed out during the winter, and the road will be opened for use of the public early next spring, or at the time the snow blockade on the adjacent mountain section is broken. The travel is exceedingly light through the winter on this section, in fact it is usually blocked off entirely by snow for about three months after the first of the year, so that there is little occasion for opening the work before next spring.

BUILDING HOMES FOR THE STATE'S FISH

(Continued from page 5.)

Yosemite Hatchery

The Yosemite Hatchery, located near "Happy Isles" in the upper end of the valley, was completed in the spring of the present year. In its construction stone and logs from the site and split sugar pine shakes were used on the exterior. Provision has been made in the building for an aquarium, in which will be displayed specimens of the different fishes of this region. In the few months since the completion of this hatchery it has been visited by thousand of people and has proven one of the centers of interest in the valley.

At the present time a cottage for the superintendent and one for employees are under construction adjacent to the hatchery building.

Cold Creek Hatchery

Construction on this project was started in November, 1927, and is now in progress. The site is in Mendocino County, adjacent to the state highway running from Ukiah to Upper Lake. The hatchery takes its name from the creek which will be the source of the water supply. This creek was selected on account of its unusually low temperature, most of the waters of the Coast Range Mountains being too warm for satisfactory propagation of fish.

The project consists of the hatchery building—in which are included quarters for employees—a cottage for the superintendent, and a garage and service building. The layout in general is quite similar to that of the Big Creek Hatchery in Santa Cruz County.

Kaweah Hatchery

Preliminary plans are being made at this time for a hatchery group at Hammond, on the Kaweah River, in Tulare County. The site is adjacent to the highway leading from Lemon Cove to Sequoia National Park. The proposed hatchery will replace a temporary hatchery which has been operated on this site for several years.

Miscellaneous

Under this heading are included various repairs and improvements which are too numerous and are of too little general interest to explain in detail. These items include alterations and additions to existing buildings, water supply and electrical development. If of minor importance they are generally handled directly by the Fish and Game Commission, but when the amount of money involved is large, or the details are such as to demand technical advice, they are handled by the Division of Architecture.

Under the laws of this country a man is innocent until he is proved guilty. Then he is usually insane.—Dallas News.

Seven states, California, New York, Pennsylvania, Ohio, Michigan, Illinois and Texas, have more than one million automobiles.

Golf is what letter-carrying, ditch-digging, and carpet-beating would be if those three tasks had to be performed on the same hot afternoon in short pants and colored socks by gouty-looking gentlemen who required a different implement for every mood.—New York Sun.

State Highway Work in Various Counties

PROGRESS REPORTS FROM THE FIELD

ALAMEDA COUNTY—The contract of N. M. Ball, Livermore to Dublin, is complete except cleanup. Resident Engineer M. C. Fosgate, is now in charge of the new contract between Warm Springs and Milpitas, at the same time taking care of the closing out of this job.

Dublin to Hayward, Contractor Ariss-Knapp, is well under way. The first two miles of waterbound macadam base complete; Castro Hill excavation complete; waterbound macadam base in progress. The heavy cut at Booner Hill is clay and progressing slowly on account of occasional rains and insufficient equipment and organization of the contractor. In wet weather all traffic is detoured via Niles Canyon.

Warm Springs to South Boundary, Allied Contractors, Inc. Contract is well under way; grading all complete for concrete strip including 1 foot below subgrade. Backfill for subgrade in progress. Shoulders on right complete. Portland cement concrete batch boxes and bunkers complete. Asphalt concrete plant well under way. This section is included with a contract from the north boundary of Santa Clara County to Milpitas to form the entire contract. Under maintenance rock borders were completed on Altamont Pass road, north boundary to Livermore.

ALPINE COUNTY—All work in Alpine County has been suspended for the winter as the mountain passes are blocked with snow and most of the highway in that county is snowbound.

AMADOR COUNTY—A district contract will be advertised soon for grading a piece of highway between Jackson and Pine Grove. This is on what is known as the "Creek road." The contemplated work will eliminate the worst portion of this road between Jackson and Pine Grove.

On account of the heavy snowfall in the Sierra Nevada Mountains, the Alpine highway is only open as far as Bartons. Bartons is approximately ten miles above Pine Grove. The highway from Bartons to Ham Station is being reconstructed with a heavy grading outfit consisting of 30 and 60 horsepower caterpillars and 12 foot graders. This work makes the road impassable to traffic.

The section of the Mother Lode highway between Plymouth and the Cosumnes River is being rocked wherever any soft places develop, so the road is in fair shape for winter travel.

BUTTE COUNTY—Preliminary studies and investigations are being made for the proposed routing of a state highway between Oroville and Quincy. The highway now in use from Oroville to Quincy follows the old county road through Berry Creek and Bucks Ranch, a distance of 66 miles.

CALAVERAS COUNTY—The Big Trees highway is open as far as Big Trees only. Above that point, the road is blocked with snow.

Widening and daylighting operations will soon start on the Mokelumne River grade between the Mokelumne River and Mokelumne Hill. This work will be financed by the Minor Improvement and Betterment Fund.

COLUSA COUNTY—The work of placing rock borders along the pavement from Williams to Delevan, 12 miles, is about 50 per cent complete. Hemstreet and Bell are the contractors.

CONTRA COSTA COUNTY—Approaches to newly constructed Wildcat Creek Bridge, advertised for construction and rock surfacing, were opened at the District office December 6, 1927.

One mile south of Rodeo the encroaching waters of the overflow of Rodeo Creek have endangered the highway. A channel change for nearly a mile is contemplated before the severe winter weather sets in.

DEL NORTE COUNTY—The contract for grading and surfacing 3.5 miles, from the southerly Del Norte County line to the head of Richardson Creek, has just been advertised and J. E. Johnston of Stockton was the low bidder. His bid was \$168,000, or approximately \$18,000 under the engineer's estimate.

Plans are being rushed in order to let to contract 3.8 miles of grading and surfacing of the last piece of old county road between Orick and Crescent City. Upon the completion of this contract the bottleneck of the Redwood highway will be broken.

EL DORADO COUNTY—Reconstruction work between Pacific House and Riverton, a joint state and United States Forest Service project, is nearing completion. This work was marked by a tragic accident on November 29th, when F. F. Irey of Irey and Holden, contractors, operating a tractor, backed off the grade and sustained injuries in the fall which resulted in almost instant death. In this vicinity there are very precipitous slopes to the American River, there being in places an almost sheer drop of several hundred feet. Many will mourn the loss of Mr. Irey for he was a man of splendid character and tremendous energy, and the driving force of this project.

FRESNO COUNTY—A reconnaissance survey in the Kings River Canyon, in Fresno County, has been authorized by the central office, and a party will be in the field within the next two or three weeks.

GLENN COUNTY—C. K. Buchanan's contract for one mile of bituminous macadam pavement with rock borders, between Four Corners and Butte City, is practically complete.

HUMBOLDT COUNTY—The Kaiser contract for grading and surfacing between Fernbridge and Loleta is practically completed and it is expected to make acceptance in a few days.

This piece of work involved the realignment of the Northwestern Pacific Railroad in order to straighten the alignment of the highway, and the many difficulties in arranging a working agreement between the property owners, the county, the railroad, and the state have at last been overcome and the new highway is a reality.

The Hauser contract and the Engelhart contract for grading and surfacing between Orick and the northerly Humboldt County line are practically at a standstill, due to the heavy winter rains having started.

IMPERIAL COUNTY—About 2.1 miles of the San Diego-El Centro highway, near the foot of Mountain Springs grade, was destroyed by floods following the heavy rains in December, 1926. As soon as the flood

subsidied, a temporary road was oiled through the sand in the bottom of the wash. This temporary oiled road has been made to serve throughout the summer of the present year, but being in the wash bottom, it is in danger of being destroyed by other floods.

A new roadbed is being constructed to replace the road that was destroyed. The line is being changed to eliminate the flood hazard and to cross the San Diego and Arizona Railroad Company's tracks at a better place for an undergrade crossing.

INYO COUNTY—A contract was recently awarded to F. C. Payton for the grading of a road, standard specifications, from Coso Junction to Olancho, distance 21 miles. This improvement on a direct relocation, eliminating a multitude of abrupt turns, will be welcomed by next season's tourist travel.

A stretch of 10 miles of crushed rock and decomposed granite surface was completed this season—Alabama Gate to Independent.

From the north end of the oiled macadam road north of Bishop to the Inyo-Mono County line, distance 5.85 miles, surfacing with decomposed granite is nearing completion preparatory to oiling next season.

Plans recently submitted for grading and surfacing with crushed rock, Diaz Lake to Alabama Gate, distance 8.50 miles.

KERN COUNTY—Widening and drainage work is being started on the Kern River Canyon highway to Walker's Pass.

Three miles of rock borders on Route 4 south of Bakersfield have just been completed by day labor forces. A spreader box was used, and two men on the grade handled all of the spreading and spotting up of 190 tons per day.

Preliminaries under way toward improvement of the Freeman-Bakersfield road, including widening and straightening of the present road, Weldon to Walker Pass, and relocation, Walker Pass to Freeman.

KINGS COUNTY—A special crew with a heavy grader and outfit is widening roadway and improving drainage in Kings County from Hanford west.

LAKE COUNTY—A survey party is rushing the location between Upper Lake and the east county line. The convict camp is located about two miles east of Sweet Hollow summit and work is progressing satisfactorily. Stormy weather makes it necessary to approach this camp by way of Lower Lake.

No construction contracts are in progress.

Under maintenance the following work is under way or contemplated:

Two timber bridges are under construction on the Calistoga-Lakeport road and are about half completed.

On the Hopland-Lakeport road, ditching work under maintenance specific is well started and under major slides work is one-fourth completed.

LASSEN COUNTY—The work of resurfacing with fine crushed rock over the Fredonia Summit, between Westwood and Susanville, was completed this month, sufficient surfacing having been applied to carry this road through the winter in good condition for traffic.

Widening, some surfacing and other improvement work has been started on the section of road built by the state and Lassen County in cooperation a couple of years ago, between Long Valley Creek and the state line, on the Reno-Susanville road. This work will be continued as long as weather permits, and considerable improvement will be effected by the time

the summer traffic sets in next year. The gravel which has been placed will render this road more usable during the coming winter.

In anticipation of work in the near future, Lassen County is now engaged in securing the rights of way for the state highway across Big Valley, between Bieber and Adin. When this section of road is completed the distance between these two towns will be shortened by over four miles, as the new location will follow an almost direct course across the valley between these towns.

LOS ANGELES COUNTY—Three of the four proposed retaining walls now being constructed on the Arroyo Seco road north of Pasadena are completed and the fourth one is in progress. The walls are being constructed as a flood protection measure.

The construction of four concrete retaining walls along the state highway in the Arroyo Seco north of Pasadena has been completed and the earth embankment back of the walls is now in place. Flood waters in the canyon following the storm of February last washed away the highway in two places and threatened it to such an extent in other places that it was necessary to protect the highway embankment with concrete walls.

Good progress continues to be made on the improvement of the Ridge Route on the Los Angeles to Bakersfield highway. A special day labor crew, superintended by M. L. Sullivan, equipped with a gas shovel and fleet of trucks, is at work improving the alignment and widening sharp curves. Work which was commenced at the foot of the Ridge Route near the Castaic school house has advanced northerly to a point beyond the state's maintenance station at Liebre.

MADERA COUNTY—Test pits for bridges are being sunk at Ash and Berenda sloughs in Madera County. These bridges, when built, will eliminate the necessity for detours when sloughs are flooded, which often occurs during the rainy season.

MARIN COUNTY—Surfacing of the Redwood highway between Ross and Larkspur (through Kentfield) has been advertised, with bids opened at the District IV office, December 6, 1927.

Reconstruction of the Redwood highway between Ignacio and San Rafael is contemplated in the near future, plans and estimates being nearly ready for advertising. Realignment and regrading, second story concrete and asphalt surface will bring this section to modern requirements.

Specific maintenance job, on the Redwood highway, San Antonio Creek to San Rafael, consisting of draining the roadway by placing drain tile, has been completed.

MARIPOSA COUNTY—Briceburg grade, on the Yosemite highway, has been widened and surfaced with oil mixed macadam and Contractor Burnett is now erecting about two miles of standard guard rail. This will adequately protect motorists who are unfamiliar with the Briceburg Grade.

MENDOCINO COUNTY—A portion of this county has recently been added to District IV, and while no contract work is contemplated in the near future, considerable maintenance work is under way.

On the Redwood highway, between Ukiah and the south boundary line, stockpiling of rock dressing taken from the adjacent river, has been started.

Between Calpella and Ukiah, the repair of the six span reinforced concrete girder type bridge over Ackerman Creek is one-half complete. The first pier north of the south abutment of this bridge was undermined by flood water, part of the pier breaking off. A pro-

tection fence of posts, Elwood fencing and brush is being built and a new pier constructed.

Ditching of the Hopland-Lakeport road has been started.

MERCED COUNTY—The road for the west boundary of Merced County to the beginning of the concrete pavement, is under maintenance by District IV. The roadway is graded and rocked and has recently been oil treated.

A contract for nine miles of rock borders on the Pacheco Pass road from Los Banos east has been awarded to Larsen Bros. of Livermore.

MODOC COUNTY—The construction of the Rattlesnake Creek bridge, a mile and a half east of Alturas, was completed by Contractor Maurer early in December and the construction of the gravel fill approaches across the meadows for a distance of about 1500 feet was also completed at that time by state forces, so that this long standing obstruction to traffic was eliminated for those who use the road through the coming winter.

The state forces, under Superintendent Clarke, have just completed the elimination of two heavy pitches in the grade of the old road west of Cedarville, on the Alturas-Cedarville highway. The elimination of these two heavy pitches by the relocation and grading of the road will enable the residents of Surprise Valley to haul maximum loads from Surprise Valley to the railroad, as the grades do not now exceed 7 per cent on the entire road.

MONO COUNTY—The widening of concrete girder bridge spans and timber spans from 16 feet to 24 feet has been under way between the Sherwin Hill and Deadman Creek for some time and it is proposed to extend this work into the Owens Valley.

The widening of dangerous points on the Tioga road has been in progress during the past season, work deferred until next season owing to stress of weather conditions. On the Sonora road the same class of work has been under way together with the erection of log bridges at Silver Creek, Silver Falls, Wolf Creek and Soda Creek. The fording of these streams has always been a menace to travel and the Sonora road throughout notorious for its limited width, steep grades and dangerous turns. Although there is still much to be done, the improvements made during the past season are very much in evidence and the trip over the Sonora Pass may now be made with comparative comfort and safety.

MONTEREY COUNTY—The construction of a bituminous surface on 20 miles of rock border between Greenfield and San Lucas has recently been completed by state forces. It is intended to carry this work southward as far as San Ardo next spring. This work was handled by R. S. Peck, foreman.

Work was recently started and is now well advanced on the contract for the reconstruction of 1.9 miles of highway north of Salinas extending from the northerly city limits, passing the Rodeo grounds to the Santa Rita road junction. This contract, which was awarded to Charles W. Wimmer, of Santa Barbara, includes the tearing up of the macadam pavement, salvaging enough rock for the construction of rock borders and the construction of a new 20 foot concrete pavement.

Preparations are being made for the construction by convict labor of a portion of the San Simeon-Carmel highway. A survey party is now engaged working north from Salmon Creek along the Monterey coast in the south end of the county and preparations are now being made for the establishment of a convict camp for the beginning of construction next spring.

NEVADA COUNTY—Maintenance station facilities at Nevada City, consisting of truck and storage building, oil house, and sewage disposal are now complete.

ORANGE COUNTY—On the reconstruction job on the state highway in Orange County, between Galivan and Irvine, 5.7 miles long, all grading and culvert work has been completed. Good progress is being made on the pavement construction, there being about 2½ miles of half-width pavement now in place.

A strip of new concrete pavement 10 feet wide, half of the proposed width, has been completed and opened to traffic along the entire length, 5.7 miles, of the reconstruction of the state highway between Galivan and Irvine. Rough grading has been completed and all culverts are in place, while work proceeds rapidly on the second 10-foot strip of concrete pavement.

On the construction of the connection between the coast highway through Huntington Beach and Laguna, with the Los Angeles to San Diego highway, at Serra, all culverts are in place and grading is in progress. The two underpass crossings of the Santa Fe tracks are completed except for paving, and the railroad company is running trains over the new roadbed, their tracks having been elevated to permit of the underpass crossings of the highway.

In cooperation with the Olive and West Orange Protection District the state is constructing 2200 lineal feet of pipe and woven wire and brush bank protection work to prevent flood waters of the Santa Ana River from cutting away the approaches to the highway bridge on the state highway between Anaheim and Santa Ana.

PLACER COUNTY—Due to unfavorable weather Hy. Nelson, contractor, has discontinued placing standard gravel road surfacing between Baxters and Shelter House No. 1, east of Gold Run, and will stockpile the material for use next spring in the "oil mix."

The work of reflooring and strengthening the two trestles over the Southern Pacific Railroad at Bowman is under way, by F. R. Remter. About a month will be required to complete the job.

PLUMAS COUNTY—Early in November, Contractor Clendenning completed the construction of a 1-mile connection between the recently completed Lake Almanor causeway at Chester and the end of the constructed highway on the east of the lake. This section was surfaced with gravel by state forces, which work completes the construction of the entire state highway between Westwood and Chester, and will be of great service to next summer season's heavy traffic.

On account of additional improvements made to the county road between Morgan Springs and Chester this year, traffic over this section through the late fall and during the early spring, before and after the snow blockade, will find the road easier to negotiate under winter conditions than it ever was before.

Additional facilities, a cook house and sewage disposal, are being installed at Spanish Ranch maintenance station.

RIVERSIDE COUNTY—Last year a realty firm subdivided property adjacent to the highway opposite the town of Coachella. Before subdivision, upon consultation with the district engineer, they agreed to donate 32 feet of additional right of way, making the state highway 92 feet wide in front of the subdivision at this point. The foresighted action of these subdividers is now bearing fruit in the development of fine business property along their subdivision.

The maintenance forces between Mecca and Blythe are rejoicing in recent rains. Following the rains

they have dragged this eighty miles of earth road and it is, at present, in better shape than for many months.

Standard guard rail to the extent of 1891 feet has been completed around the sharp curve east of White-water bridge as a safeguard to traffic.

SACRAMENTO COUNTY—The concrete paving work at the approaches to the Ben Ali subway under contract to C. W. Wood is progressing. It is expected the subway will be open by Christmas.

The reconstruction work between Sylvan School and Roseville is well under way. Grades and line are being improved and roadway widened. A 20 foot asphaltic concrete pavement, 6 inches thick, is being placed as a reconstruction job. Where the present grade is followed the pavement will be widened and thickened with asphalt concrete to conform to the new work. Two feet by 4-inch rock borders will also be constructed. J. C. Compton is the contractor.

L. D. Moore, Sacramento, was awarded on November 30 the contract for placing 400 tons of standard crushed rock surfacing from the intersection of Del Paso boulevard and El Camino avenue, North Sacramento, to a point about two miles easterly. The portion now being paved at the Ben Ali subway excepted.

The Arno job, a line improvement between Sacramento and Galt, is just getting under way. Bids were opened November 7, and Mankel & Staring were low bidder. Eleven bids were received. On November 19, Contract 910EC2 was awarded to Mankel & Staring. The construction consists of grading and surfacing with standard road surfacing, crushed gravel or stone. The contract bid was \$38,331.30, while the engineer's estimate was \$44,202.90. A. K. Nulty, previously with this district, but more recently with District VI, has been assigned as acting resident engineer on this contract.

The long trestle north of Arno is being repaired by maintenance crews to place it in good shape prior to high water.

SAN BENITO COUNTY—A new concrete bridge built by the state with the cooperation of San Benito County has recently been completed across Pacheco Creek on the Pacheco Pass cut-off about seven miles north of Hollister. This was constructed by George J. Ulrich, contractor, under the supervision of the Bridge Department.

A section of the Hollister-Gilroy road is under the jurisdiction of District IV. The bridge across Pacheco Creek is completed and it is proposed to finish grading the approaches on the new alignment, regrade a section of same and construct rock surfacing. It is hoped to complete this work before the heavy winter rains.

SAN BERNARDINO COUNTY—The Foothill boulevard is the main artery for travel between the city of San Bernardino and Los Angeles. Traffic over this route is continually increasing and San Bernardino County has found it necessary to improve and maintain parallel roads on both sides of this highway within a distance of two miles.

The present pavement on this road was constructed between the years 1913 and 1915. Prior to this time this road consisted only of two well-worn wheel tracks in the sand with a few stretches of old broken oil cake.

The Foothill boulevard will soon advance to the third stage in its development. The 18-foot pavement laid in 1914 has served well for a period of 13 years, but it is breaking down under the hammering of the endless line of traffic. A project is now under way to repair this pavement and widen it to 30 feet, the first unit of the work being under construction by Contractor Steele Finley of Santa Ana.

The engineers are not unmindful of the necessity of a possible fourth, fifth or innumerable other stages of

this development in the future, hence the activity of our Right of Way Department which is securing deeds for a 100-foot right of way throughout. The property owners are to enjoy possession of the additional width thus acquired until such time as it is needed for highway purposes.

OCEAN TO OCEAN HIGHWAY, REDLANDS TO SAN BERNARDINO-RIVERSIDE—About five miles of the Ocean to Ocean highway, extending from the city limits of Redlands to the San Bernardino-Riverside County line is now being reconstructed. The first mile of the existing road is an old and broken cement concrete pavement 16 feet wide and extends to the Yucaipa junction. This will be repaired by placing a new 20-foot cement concrete pavement on top of the old pavement. The remainder of the road is now an old and worn oiled macadam. This will be torn up and replaced by a 6-inch cement concrete pavement 20 feet wide. The material in the old macadam will be salvaged and placed along the edges of the new pavement, thereby increasing the width which can be used for travel.

CREST ROUTE—The improvement of the Crest route from Running Springs Park has been under way since July, 1926. The new road is being constructed along a survey made by the United States Bureau of Public Roads and will form an extension of the proposed new high gear road from San Bernardino toward Big Bear Lake. A small crew operating a gas shovel has been employed and to date about four miles of grading has been completed.

SAN DIEGO COUNTY—All work has been completed on the La Mesa to El Cajon reconstruction job in San Diego County. The new 20-foot concrete pavement with broad shoulders replaces a stretch of 15-foot pavement with numerous sharp curves.

Placing of the concrete pavement on the line change which will carry the highway over the new overhead crossing of the Santa Fe tracks at Del Mar in San Diego County, has been completed. Work is now in progress placing bituminous macadam where the new fills were too deep to pave with concrete.

On the San Diego to El Centro highway between Sweetwater Bridge and Live Oak Springs, the maintenance crews are surfacing with disintegrated granite, stretches of highway aggregating over four miles.

A special maintenance crew working under a specific allotment recently completed the construction of 3000 lineal feet of pipe and woven wire and brush bank protection work along Pine Valley Creek and La Posta Creek where the San Diego to El Centro highway was damaged during the storm of February.

SAN FRANCISCO—The only work done in this county was the slide control work on the Skyline boulevard.

SAN JOAQUIN COUNTY—Grading work on the new northerly entrance to Stockton, under a contract awarded to Irey & Holden, is progressing as rapidly as weather conditions will permit. The grading is nearly completed and some gravel has been placed north of Cherokee Station. The contract calls for constructing a graded roadway and placing standard road surfacing, crushed gravel or stone. Jess Cole is resident engineer on this contract.

SAN LUIS OBISPO COUNTY—The reconstruction of the highway from San Luis Obispo to Pismo was recently awarded to J. F. Knapp, contractor. Grading and culvert work is moving ahead rapidly. The contractor's organization includes two shovel outfits, two culvert crews, a clearing and a fencing crew. The first portion of the road to be graded is the short

hill known as Ontario grade, near where the highway first reaches the ocean.

Extensive work is under way for realignment of bad curves throughout San Luis Obispo County. Four of the sharpest curves between Paso Robles and Templeton were recently replaced by long radius curves making easy alignment over this portion of the road. Plans have been prepared for the elimination of most of the sharper curves between San Luis Obispo and Santa Margarita and construction work is now starting on the realignment of two of these curves about three miles north of San Luis Obispo.

SAN MATEO COUNTY—The contract for grading roadway and constructing structure on the Bottleneck on the Peninsula highway, Colma to Cypress Lawn cemetery, Kaiser Paving Co., has been completed and final estimate and report submitted.

As a preliminary contract to the paving of this section, an extremely expensive and difficult piece of work, it has been brought to a successful conclusion to the satisfaction of the contractor and state.

The paving of this section by the Hanrahan Co. is nearing completion: 90 per cent of concrete has been poured and the asphalt concrete work is well started at street railway crossings.

The feat of opening most of this roadway to the heavy traffic of the annual California-Stanford football game, November 19, was a noteworthy one. The last of the necessary concrete, a 7-sack mix and calcium chloride, was poured in time to open to traffic at 8.30 a.m., November 19, 1927, both north and southbound traffic being split on their proper lanes.

The Bayshore highway is receiving considerable attention lately.

The section of original county road, San Francisco to South San Francisco, is being resurfaced and patched with asphalt concrete. Federal Construction Co., contractors. This is only temporary work, pending the complete construction of a new highway, plans and estimate for which are nearly complete and a contract for which should be let shortly.

The surfacing of the section from South San Francisco to Broadway Station is pending an award of contract and should progress rapidly.

The advertising of the grading and rocking of the section between Broadway Station and Fifth avenue, San Mateo, will soon be made and with the completion of this section a wide highway would be opened to relieve the congestion of the Peninsula highway.

The investigation for the purpose of determining the correct method of controlling a critical slide condition on the Skyline boulevard near the San Francisco-San Mateo County line, through the Olympic Club Golf Club grounds, has been three-fourths completed.

Considerable money has been spent endeavoring to control this situation as an extremely expensive relocation and construction of the highway will be necessary if this slide continues.

Under a Day Labor Maintenance Work Order the shoulders were widened on the Peninsula highway between San Mateo and Redwood City.

On the Peninsula highway, between Beresford and Redwood City, the concrete structures over Laurel and Cordilleras creeks were widened.

SANTA BARBARA COUNTY—An old concrete and masonry bridge over Badger Creek about one mile north of the city of Santa Barbara which has proved inadequate for modern loads has recently been strengthened by state forces working under J. S. Butler, foreman. This work included the placing of steel I beams intermediate between the existing girders, the new steel I beams being encased in gunite.

On the San Jose Creek bridge, about five miles north of Santa Barbara, repair of damage caused by the heavy floods of last winter has recently been completed by state forces under the direction of J. S. Butler, foreman.

The construction of a bituminous surface over the rock borders between Santa Barbara and Goleta has recently been completed by state forces under the direction of J. S. Butler, foreman.

The construction of a concrete highway 30 feet wide on a newly widened right of way 80 feet wide has recently been completed between Carpinteria and Summerland, south of Santa Barbara. This work was performed by Sam Hunter, contractor, with E. B. Brown and later C. M. Butts, as resident engineers.

Work has just been completed on grading and surfacing the approaches to the new concrete bridge in Gaviota Canyon. This construction follows a new alignment which eliminates two very dangerous curves. The work was performed under a district contract with Ira Hodson and E. P. Carter, contractors, and T. W. Voss, resident engineer.

Contract has recently been awarded to J. F. Collins, contractor, for the construction of 24 miles of rock borders in the northern part of Santa Barbara County between Orcutt and Zaca.

SANTA CLARA COUNTY—The Oakland-San Jose road, between the north boundary and Milpitas, is under construction, Allied Contractors, Inc., contractors. This section is included with the section in Alameda County. Grading for Portland cement concrete strip and shoulders on right is complete. Pouring of concrete strip should start soon. When the asphalt plant is complete and weather conditions allow, the asphalt pavement can be constructed, but at this time of the year that is problematical.

Plans for a grade separation on the Pacific highway near Sargent are under preparation, to be advertised in the near future.

The timber bulkhead to be constructed on the Peninsula highway near Redwood City has not been started, but material has been ordered.

Repair of storm damage in channel change on the Pacheco Pass road, about 9 miles east of Gilroy, at Cedar Creek, has been completed. This work consisted of widening and deepening channel and of strengthening the wire guard fence.

SHASTA COUNTY—Graveling on the Redding-Alturas road between Montgomery Creek and Round Mountain, which was completed this month, will greatly improve this section for the coming winter. Numerous sharp curves are being flattened and widened on the section east of Montgomery Creek, over Hatchet Creek Mountain which, when completed during the next month or two, will effect a considerable improvement on this section.

Work is just starting on the widening of some of the very narrow road which was constructed by convicts at Manzanita Hill, about 30 miles east of Redding. Although this work will not bring this portion of the highway up to modern standards, it will be a great help to traffic, as this section is one of the most narrow and dangerous pieces on this road.

Work is progressing nicely on the section of the reconstruction of the Pacific highway between LaMoine and Shotgun Creek. The grading work is more than 80 per cent complete, and rock surfacing will follow rapidly, so that this portion of the road will be in suitable condition for handling traffic this winter, although it is not expected that the entire contract will be completed before March.

The bridges across Dog Creek and Slate Creek on the 5-mile section south of LaMoine were completed and opened to traffic early this month. The opening

of these two bridges shortens the distance between Redding and Dunsmuir by a full mile, due to the relocation of the highway connected with the bridges.

The convict camp which has been engaged on work in Del Norte County for the past two years, has now been moved to the Buckhorn Summit, about 20 miles west of Redding, and has settled down to work on that section. One hundred twenty men are engaged on this work, which is of a very heavy nature, and are making excellent progress.

SISKIYOU COUNTY—Widening of the graded section and the extension of culverts in connection therewith, along the pavement between Dunsmuir and Weed, was completed in November, by the state maintenance forces, and numerous narrow places were eliminated, making this road generally roomier and more comfortable for traffic.

The graded connections to the temporary bridge across Beaver Creek, on the Klamath River road, were widened and improved this month, and work of the same nature is going on on two or three other short stretches of this road, which will effect a noticeable improvement to those who use it.

SOLANO COUNTY—Plans and estimates have been submitted to our central office for grading and surfacing the road from the Napa County line to a point north of Cordelia. This road lies between Napa Junction and Fairfield. The proposed work consists of widening the roadway and improving grades through Jameson Canyon; also the construction of a road over new right of way north of Cordelia. The surfacing under this improvement will consist of widening and thickening the existing pavement with bitumen macadam and surfacing the new road with standard road surfacing, crushed gravel or stone.

Maintenance crews will soon start replacing all dead and defective trees along the state highway in Solano County.

SONOMA COUNTY—The construction and surfacing of approaches to the newly constructed bridge over Sonoma Creek on the Black Point cut-off near Schellville, has been advertised. This project is of great value and interest as the new alignment cuts out two very sharp curves on the road to Napa, and allows the use of a new, wide bridge instead of the old narrow county-built structure which is near failure.

The ditching on the Redwood highway between the northerly boundary and Cloverdale is well started under 94K1.

On the Redwood highway, between Cloverdale and Healdsburg, near Lytton, the guard rail is about half completed.

STANISLAUS COUNTY—Bids will be called for soon for the construction of a highway north of Ceres over new right of way. This line change will replace two sharp reverse curves with long easy curves. The proposed construction will consist of grading and placing asphaltic concrete pavement 20 feet wide on a crushed gravel or stone subbase.

The Sonora Pass road is open as far as Long Barn. Heavy snow and rain have closed the road above that point. Maintenance crews are doing some excellent work on the road between Long Barn and Strawberry to place it in shape for summer travel.

TEHAMA COUNTY—Bids were received early this month covering the application of additional rock surfacing on the county road which is under state maintenance, from Red Bluff to a point 2 miles east of Dale's Ranch, on the Red Bluff-Susanville road. It is planned to complete this work during the winter, allowing sufficient wet weather to compact the rock thoroughly, and to oil this section next summer, thereby

eliminating one of the roughest portions of this road for next season's traffic.

Work of widening the roadway, building up the shoulders, and improving the drainage has been going on between Corning and Red Bluff, and between Red Bluff and Cottonwood for the past two months, and the work contemplated at this time will be completed during the winter. This work will bring additional sections of these roads up to the modern 30-foot standard of width.

Numerous sharp turns on the highway between Mineral and Paynes Creek were flattened and widened during the past two months, which will effect a noticeable improvement for the heavy summer traffic which uses this road each season.

TRINITY COUNTY—Construction of a bridge across the Trinity River at Cedar Flat has reached such a point that there is now no danger of high water interfering seriously with the completion of the work. Even though the water does reach flood stage now, the work of completing the superstructure may proceed without interruption, and it is expected that this bridge, including the approaches, will be completed and open for traffic some time in February.

The work of widening and eliminating sharp turns on the road between Forest Glen and Mad River, a portion of the Red Bluff-Eureka road, was completed last month. After passing through the winter, the numerous grade changes made will have settled, and will be trimmed up in the spring, so that those using this portion of the road next summer will notice a decided improvement in it.

TULARE COUNTY—The outfit painting center line is now working on Route 4 in Tulare County. Progress is slow on account of wet weather and fog.

TUOLUMNE COUNTY—Widening and improving the alignment on the Big Oak Flat road near Berkeley Camp by maintenance forces is being financed by the Minor Improvement and Betterment Fund.

Maintenance crews are being kept busy removing slides on Priests grade which have been caused by recent heavy rains.

For the first time in the history of the Big Oak Flat road, traffic will have no difficulty in going as far as South Fork during the winter, as during the summer months that highway was rocked from Groveland to South Fork, placing it in good shape. We would not advise motorists to attempt to use the Big Oak Flat road above South Fork, as the heavy rains and snow have made this part of the road impassable.

VENTURA COUNTY—The construction of 650 feet of concrete retaining wall across a sand pocket in the slope between the state highway and the Southern Pacific Railroad near Sea Cliff, west of Ventura, has recently been completed by Hall Brothers, contractors.

Six hundred lineal feet of bank protection is being constructed along the west side of the Santa Clara River, on the coast highway between El Rio and Montalvo. The work, which is being done by a special maintenance crew, consists of the construction of thirty reinforced concrete skeleton tetrahedrons, tied together with 1-inch cables. This type of bank protection has been used with excellent results along the Santa Clara River since 1912.

YOLO COUNTY—Drainage conditions at the M street subway in West Sacramento have been greatly improved by the placing of an automatic pump and several hundred feet of tile drain.

The firm of Davies & James of Stockton are painting the guard rail on the Yolo causeway and approaches.

FROM OTHER STATES

ARIZONA—The Arizona highway commission has approved the budget for the highway department for the fiscal year ending June 30, 1928, calling for a \$5,200,000 program.

State Engineer W. C. Lefebvre and W. W. Lane, chief engineer, will commence at once to prepare plans and specifications for the project to be taken up at once under the budget, and to advertise for bids for those projects scheduled to be started first.

The first work to be done will be the completion of the two miles of the Apache Trail necessary to reopen it.

COLORADO—Pavement assaying three thousand dollars in gold to the mile was laid near Colorado Springs. Mine tailing from the Cripple Creek district, containing \$1.50 in gold to the ton, was found to be the most economical aggregate.

KENTUCKY—The eighth biennial report of the Highway Commission of Kentucky states that:

"The total receipts from all sources, federal, state and county, for the two fiscal years, 1925-26 and 1926-27, covered by this report were \$26,773,989.68. The total disbursements for the same biennium \$21,288,983.09. Of the latter amount \$7,666,766.48 was for construction and reconstruction work done under contracts made prior to the period, but completed in whole or in part during this period. The sum of \$6,113,120.70 was for construction and reconstruction contracted for within the period and finished in whole or in part during such period—a total for construction \$13,779,887.18. The total for maintenance, additions and betterments to roads and bridges, not including all reconstruction done under the head of maintenance, nor the expenditures of the Division of Equipment, was \$4,253,006.

"Construction has been so distributed that the principal gaps on all through routes have been closed, leaving only a scattered few yet to be let to contract for constructive improvement of a high standard. Much of the work of the past year and that of 1925-26 has been the surfacing of projects graded and drained in years previous."

MICHIGAN is preparing to include a larger mileage than ever before in its snow-removal program. Last winter 5705 miles was served at a total cost of \$302,474 or \$53.02 a mile.

MINNESOTA—Maintenance of paved roads in Minnesota averages between \$150 and \$300 per mile, about \$50 of which is spent on the concrete slab itself.

NEW YORK—The New York Assembly at its last session defeated a measure providing for the collection of a 2-cent gasoline tax. In a recent trade paper an official of the New York Automobile Merchants' Association explains why his organization persistently fought the measure. He states that raising funds for highway construction and maintenance by means of registration fees and gasoline tax, set at a figure proportionate to the highway budget, is fair and reasonable. The objection his association had to the New York program was that *only half* of the funds raised were to be spent for highway improvement, the balance to be used for other purposes.

OHIO—Motor trucks handle more freight than railroads from Columbus to cities within 40 miles, revealed the recent state-wide transportation survey. Highways bore 84.5 per cent of all freight traffic to destinations less than 20 miles distance, 54.7 per cent up to 40 miles, and 32, 24.2 and 2.3 per cent, respectively, to destinations in succeeding 20-mile zones.

UTAH—More than \$500,000 will accrue to the Utah state highway department from general property tax levied for state road purposes during 1927, according to official reports. This revenue will be available to supplement other sources of revenue in the construction and maintenance of the state road system. Its use principally will be to match federal aid in large construction projects and match state aid in some few instances in minor improvements. Under policies laid down by the department none of the money raised from state road taxes levied against general property may be used for maintenance purposes and under the state law the money must be expended in the counties wherein raised. The taxes are levied by the county commissions but are expended by the state department.

WASHINGTON, D. C.—Plans for adding to the system of outer and inner boulevards, parkways, plazas, and recreational centers have been announced by the Capital Park and Planning Commission.

WISCONSIN—With the signing of a bill passed by the legislature almost unanimously, that provides \$100,000 from the motor vehicle license fees with which to pay the state's share of the apportionable cost of grade crossing improvements, it is believed that the state has made a start in a campaign to force the gradual elimination of the grade crossing hazard on the main traveled highways in Wisconsin. There are about 9000 grade crossings in the state, about one-tenth of these being on the state trunk and federal highway systems.

The largest yearly construction program in the history of the highway department is rapidly nearing completion. The 1927 program of approximately 400 miles of concrete surfacing and 1500 miles of gravel and crushed rock surfacing has completed a large number of connecting links on important through highways and has also extended the trunk highway system of hard surfaced roads into sections of the state that have been virtually impassable, especially during the spring break-up due to frost boils and soil conditions. One of the notable features of the present year's program is the construction of a 20-foot width concrete pavement on one of Wisconsin's most important highways in four counties, totaling approximately 60 miles. Under the present plans, it is anticipated that this highway will be paved with concrete from Beloit to the north Marathon county line, a distance of approximately 220 miles, by 1930.

November Record of Bids and Awards

DIVISION OF HIGHWAYS

DEL NORTE COUNTY—Grading and surfacing 3.5 miles between Richardson Creek and southerly boundary. Dist. I, Rt. 1, Sec. A. Engineer's estimate \$185,983.75. Bids opened Nov. 21st as follows: Mercer-Fraser Co., Eureka, \$178,214.10; Pierson and Wm. Von Der Hellen, Medford, Ore., \$169,835.05; James T. Logan, Grants Pass, Ore., \$203,865.75; Jasper-Stacy Co., San Francisco, \$236,912.10; A. J. & J. L. Fairbanks, Inc., San Francisco, \$172,217.40; C. R. Adams, Yreka, \$172,420.80; Kaiser Paving Co., \$197,014.40; Engelhart Paving & Const. Co., \$198,865.50; J. E. Johnston, Stockton, \$168,322.40; Guerin Bros., San Francisco, \$169,771; W. H. Hauser, Oakland,

\$219,320; Tieslau Bros., Berkeley, \$188,104.55. Contract awarded to J. E. Johnston, \$168,322.40.

IMPERIAL COUNTY—Timber bridge across Bullhead Slough and another timber bridge across West Main Canal. Dist. VIII, Rt. 12, Sec. C. Engineer's estimate \$13,085. Bids opened Nov. 7th as follows: Greene Construction Co., Los Angeles, \$13,279.50; Pioneer Transfer Co. of Calexico, \$12,443.50; W. M. Ledbetter & Co., Los Angeles, \$14,736; Norman B. Conway, Los Angeles, \$15,454.50. Contract awarded to Pioneer Transfer Co. of Calexico, \$12,443.50.

MERCED COUNTY—Widening with rock borders 8.7 miles between Los Banos and easterly boundary. Dist. VI, Rt. 32, Sec. C. Engineer's estimate \$21,980. Bids opened Nov. 7th as follows: C. W. Wood, Manteca, \$22,260; Larsen Bros., Livermore, \$17,430; Valley Paving & Construction Co., Visalia, \$19,530; Stewart & Bland, Fresno, \$19,138. Contract awarded to Larsen Bros., Livermore, \$17,430.

ORANGE COUNTY—Dewatering system for Serra subway. Dist. VII, Rt. 60, Sec. C. Engineer's estimate \$7,480. Bids opened Nov. 5th as follows: F. H. Vehring, Long Beach, \$4,885; Thomas Haverty Co., Los Angeles, \$5,504; R. R. Bishop, Long Beach, \$6,701.50; Wheeler Co., Los Angeles, \$7,580; George Herz & Co., San Bernardino, \$8,877; V. R. Dennis Const. Co., San Diego, \$13,660. Contract awarded to F. H. Vehring, \$4,885.

SACRAMENTO COUNTY—Grading and gravel surfacing 1.8 miles one mile south of Arno to one mile north of Arno. Dist. X, Rt. 4, Sec. A. Engineer's estimate \$44,202.90. Bids opened Nov. 7th as follows: C. W. Wood, Manteca, \$46,379.10; M. A. Jenkins, Sacramento, \$46,480.50; J. F. Collins, Stockton, \$45,048.50; C. T. Malcom, Walnut Creek, \$47,724.60; Tieslau Bros., Berkeley, \$46,542; Mankel & Staring, Sacramento, \$38,331.30; P. L. Burr, San Francisco, \$50,351.80; M. J. Bevanda, Stockton, \$50,196.30; A. Teichert & Son, Inc., Sacramento, \$57,848.80; Edward K. Rice, Sacramento, \$51,395.50; Charles Harlowe, Jr., Oakland, \$47,892. Contract awarded to Mankel & Staring of Sacramento, \$38,331.30.

SAN MATEO COUNTY—Resurfacing with asphaltic concrete 4.5 miles between Visitation Valley and South San Francisco. Dist. IV, Rt. 65, Sec. A. Engineer's estimate \$13,200. Bids opened Nov. 1st as follows: Federal Construction Co., San Francisco, \$10,532; Pay Improvement Co., San Francisco, \$14,700; Eaton & Smith, San Francisco, \$13,500; A. G. Raisch, San Francisco, \$12,840; Hanrahan Co., San Francisco, \$13,720; Christensen Construction Co., San Francisco, \$12,944; Pacific States Construction Co., San Francisco, \$11,940. Contract awarded to Federal Construction Co., \$10,532.

SAN MATEO COUNTY—Grading and surfacing with crushed stone 5.2 miles between South San Francisco and Broadway Station. Div. IV, Rt. 68, Sec. B. Engineer's estimate \$140,005. Bids opened Nov. 14th as follows: Granite Construction Co., Watsonville, \$123,498; Eaton & Smith, San Francisco, \$162,835; McDonald & Maggiora, San Francisco, \$137,110; Tieslau Brothers, Berkeley, \$128,127.50; Grantfield, Farrar & Carlin, San Francisco, \$108,210; C. W. Wood, Manteca, \$135,780; Jack Casson, Hayward, \$133,239; Allied Contractors, Inc., Omaha, Neb., \$127,221.60; Guerin Bros., San Francisco, \$131,454; Peninsula Paving Co., San Francisco, \$142,089; J. P. Holland, Inc., San Francisco, \$119,000. Contract pending.

SANTA BARBARA COUNTY—Widening with rock borders 24 miles between Orcutt and Zaca. Dist. V, Rt. 2, Sec. A. B. C. Engineer's estimate \$65,550. Bids

opened November 7th as follows: J. F. Collins, Stockton, \$59,340; Tieslau Brothers, Berkeley, \$79,350; M. Blumerkranz, Los Angeles, \$64,860; Pearson & Benson, Santa Monica, \$69,690; Nighbert & Carnahan, Bakersfield, \$65,550. Contract awarded to J. F. Collins, Stockton, \$59,340.

SIESTA COUNTY—Bridge across Shotgun Creek 3½ miles south of Sims. Dist. II, Rt. 2, Sec. D. Engineer's estimate \$19,435. Bids opened Nov. 17th as follows: E. B. Skeels, Roseville, \$19,902.50; Holdener Construction Co., Sacramento, \$23,375; Victor R. Gede, Oakland, \$24,567.50; E. M. Bordwell, Napa, \$20,231.25; A. Young, Yreka, \$21,670; J. P. Brennan, Redding, \$22,862.50; Noble Bros., San Jose, \$25,485. Contract awarded to E. B. Skeels of Roseville, \$19,902.50.

DIVISION OF ARCHITECTURE

NAPA STATE HOSPITAL—Pasteurizer and cooling equipment. Bids opened Nov. 10th as follows: Creamery Package Mfg. Co., San Francisco, \$3,513; Vulcan Iron Works, San Francisco, \$3,885; Cyclops Iron Works, San Francisco, \$3,900. Contract awarded to Creamery Package Mfg. Co., San Francisco, \$3,513.

NAPA STATE HOSPITAL—White tile and marble work. Bids opened Nov. 2d as follows: H. P. Fischer Tile & Marble Co., Sacramento, \$872; H. O. Adams, Sacramento, \$912; Art Tile & Mantel Co., San Francisco, \$995; Mangrum & Otter, Inc., San Francisco, \$1,130. Contract awarded to H. P. Fischer Tile & Marble Co., Sacramento, \$872.

SAN JOSE STATE TEACHERS COLLEGE—Repairs to roof of main building. Bid opened Nov. 8th. W. J. Porter, San Jose, \$1,439. Contract awarded to W. J. Porter.

PATTON STATE HOSPITAL—Tile roof on wards C and D. Estimate \$2,625. Bids opened Nov. 8th as follows: Sunset Tile Co., Redlands, \$1,584.69; R. G. Blessing, Alhambra, \$1,890; French & Meloney, Los Angeles, \$1,995; C. L. Passmore, Los Angeles, \$3,376. Contract awarded to Sunset Tile Co., Redlands, \$1,584.69.

CALIFORNIA POLYTECHNIC SCHOOL—Electrical work in boys' dormitory. Estimate \$1,580. Bids opened Nov. 15th as follows: Jacobs Electric Co., S. Pasadena, \$1,548; A. V. Cline, San Luis Obispo, \$1,678; Valley Electric Co., San Luis Obispo, \$1,773; Walter H. Smith, Long Beach, \$1,850; Matson-Seabrooke Co., Oakland, \$2,331; C. V. Hitchcock, Pacific Grove, \$3,397. Contract awarded to Jacobs Electric Co., \$1,548.

General work on boys' dormitory. Estimate \$29,310. Bids opened Nov. 15th as follows: Peter Sorensen, San Francisco, \$26,295; Lamb & Bobick, Sacramento, \$28,400; Alfred L. Vezina, Santa Barbara, \$28,440; Carl N. Swenson, San Jose, \$28,835; Roy L. Richardson, Santa Barbara, \$29,100; Ira C. Boss, Sacramento, \$29,190; W. J. Smith, San Luis Obispo, \$29,744; Theo. M. Maine, San Luis Obispo, \$29,800; Schuler and McDonald, Oakland, \$30,375; R. S. K. MacMillen, San Francisco, \$44,299. Contract awarded to Peter Sorensen, San Francisco, \$26,295.

Plumbing and heating work in boys' dormitory. Estimate \$6,570. Bids opened Nov. 15th as follows: Latourrette-Fical Co., Sacramento, \$7,390; E. M. Payne, San Luis Obispo, \$7,460; Walter H. Smith, Long Beach, \$8,366; Sweeney & Sons, Santa Barbara,

\$9,997. Contract awarded to Latourrette-Fical Co., \$7,390.

PRESTON SCHOOL OF INDUSTRY—Moving clubhouse. Bids opened Nov. 18th as follows: O. F. Brown, Sacramento, \$800; D. H. Moiser & Son, Sacramento, \$1,090. Contract awarded to O. F. Brown.

SACRAMENTO ARMORY—New wood floor. Estimate \$3,590. Bids opened Nov. 18th as follows: Layrite Floors, Oakland, \$2,980; McLean Hardwood Floor Co., Stockton, \$3,050; Royal Floor Co., San Francisco, \$3,072; Sacramento Valley Floor Co., Sacramento, \$3,195; Geary Floor Co., San Francisco, \$3,250; Sacramento Hardwood Floor Co., Sacramento, \$3,250. Contract awarded to Layrite Floors, Oakland, \$2,980.

PRESTON SCHOOL OF INDUSTRY—Return tubular boiler and equipment. Estimate \$12,000. Bids opened Nov. 22d as follows: Walter S. Leland, San Francisco, \$9,607; Alt. No. 1, \$11,465; E. L. McCurtain, San Francisco, \$10,470; Alt. No. 1, \$11,599; Latourrette-Fical Co., Sacramento, \$10,327; R. G. Meyler Corp., Los Angeles, \$11,300; Alt. No. 1, \$12,560. Contract awarded to Walter S. Leland, San Francisco.

VETERANS' HOME—Tile roofing Post Exchange. Bids opened Nov. 23d as follows. (Furnishing and laying.) W. L. Saxby, Oakland, \$1,750; Eckhardt & Ferrabee, Oakland, \$1,847; Homer H. Sosso, San Francisco, \$1,970; Malott & Peterson, San Francisco, \$2,120. (Furnishing only.) Gladding, McBean & Company, San Francisco, \$1,315; W. L. Saxby, Oakland, \$1,425; California Pottery Co., Oakland, \$1,451. Contract awarded to Gladding, McBean & Co.

MENDOCINO STATE HOSPITAL—White tile and marble work on Wards "D" and "S." Bids opened Nov. 25th as follows: H. O. Adams, Sacramento, \$2,175; H. P. Fischer Tile, Sacramento, \$2,238; Art Tile & Mantel Co., San Francisco, \$2,876; Mangrum & Otter, Inc., San Francisco, \$3,120; E. W. M. Evans & Sons, Petaluma, \$3,124. Contract awarded to H. O. Adams, Sacramento, \$2,175.

WATER PERMITS AND APPLICATIONS

Permits to appropriate water issued by the Department of Public Works, Division of Water Rights, during the month of November, 1927:

TRINITY COUNTY—Permit 2919, Application 5605; issued to J. H. Bannon, Hayfork, November 16, 1927, for 2.5 cubic feet per second from Morgan Gulch in section 18, T. 31 N., R. 11 W., for mining purposes in section 18.

Permit 2920, Application 5615; issued to J. H. Bannon, Hayfork, November 16, 1927, for 2 cubic feet per second from McCovey Gulch in section 8, T. 31 N., R. 11 W., for mining purposes in section 18. Estimated cost \$1,000.

LASSEN COUNTY—Permit 2927, Application 3232; issued to Homer C. Jack and Antone Avilla, Bieber, November 30, 1927, for 4910 acre-feet per annum from (1) Packwood, (2) Windmill Flats and (3) Juniper creeks in sections 29 and 16, T. 37 N., R. 9 E., and section 36, T. 38 N., R. 8 E., for irrigation of 2480 acres near points of diversion.

Permit 2928, Application 5609; issued to Max K.

Lambert, Doyle, November 30, 1927, for 1.5 cubic feet per second from Long Valley Creek in section 35, T. 26 N., R. 16 E., for irrigation of 120 acres in section 35. Estimated cost \$1,000.

NEVADA COUNTY—Permit 2909, Application 5327; issued to Chas. J. Lyser, agent for the Spanish Mining Company, c/o John F. Davis, 1404 Humboldt Bank Building, San Francisco, November 3, 1927, for 1.5 cubic feet per second from Devil's Canyon Creek in section 30, T. 18 N., R. 11 E., for power purposes in section 31. One hundred twenty-eight t.h.p. to be developed. Estimated cost \$5,000.

PLACER COUNTY—Permit 2917, Application 5673; issued to Arthur A. Halliker, Auburn, November 15, 1927, for 0.2 cubic foot per second from Antelope Ravine in section 8, T. 11 N., R. 7 E., for domestic and irrigation of 13.5 acres. Estimated cost \$500.

EL DORADO COUNTY—Permit 2923, Application 5686; issued to Moose Camp Ground of California, c/o Walter J. Morris, secretary, 2674 Twenty-fourth street, Sacramento, November 25, 1927, for 0.039 cubic foot per second from unnamed stream in section 22, T. 11 N., R. 16 E., for domestic purposes in sections 22 and 23. Estimated cost \$2,000.

Permit 2924, Application 5602; issued to Robert M. Price, Reno, Nevada, November 28, 1927, for 0.001 cubic foot per second from Celesta Creek in section 22, T. 12 N., R. 17 E., for domestic purposes in section 22.

Permit 2911, Application 5679; issued to Selden Ruger Sponsler, 1143 Fulton street, Palo Alto, November 4, 1927, for 0.002 cubic foot per second from unnamed stream in section 15, T. 12 N., R. 17 E., for domestic use in section 15. Estimated cost \$25.

YUBA COUNTY—Permit 2913, Application 5590; issued to Mrs. Mary A. Bean, Strawberry Valley, November 14, 1927, for 0.003 cubic foot per second from West Branch of Rich Gulch in section 29, T. 20 N., R. 8 E., for domestic and irrigation of 1 acre. Estimated cost \$600.

Permit 2914, Application 5677; issued to Mrs. Mary A. Bean, Strawberry Valley, November 14, 1927, for 0.025 cubic foot per second from West Branch of Rich Gulch in section 29, T. 20 N., R. 8 E., for operation of hydraulic ram. Estimated cost \$600.

Permit 2915, Application 5591; issued to John A. Bean, Strawberry Valley, November 14, 1927, for 0.003 cubic foot per second from East Branch of Rich Gulch in section 29, T. 20 N., R. 8 E., for domestic and irrigation of 1 acre. Estimated cost \$600.

Permit 2916, Application 5678; issued to John A. Bean, Strawberry Valley, November 14, 1927, for 0.025 cubic foot per second from East Branch of Rich Gulch in section 29, T. 20 N., R. 8 E., for operation of hydraulic ram. Estimated cost \$600.

BUTTE COUNTY—Permit 2912, Application 5137; issued to W. F. Nantz, 2752 Grove street, Oakland, November 7, 1927, for 2.5 cubic feet per second from Lateral A. of Reclamation District 833, in section 8, T. 18 N., R. 2 E., for irrigation of 100 acres in section 8. Estimated cost \$100.

GLENN COUNTY—Permit 2910, Application 5667; issued to Paul Kastner, Orland, November 4, 1927, for 0.09 cubic foot per second from unnamed stream in section 5, T. 21 N., R. 3 W., for irrigation of 7 acres. Estimated cost \$300.

Permit 2926, Application 5395; issued to Eugene Eagan, Orland, November 29, 1927, for 0.21 cubic foot per second from unnamed stream in section 34, T. 22 N., R. 3 W., for irrigation of 17 acres in section 34. Estimated cost \$200.

NAPA COUNTY—Permit 2921, Application 5613; issued to Claude L. Russell, Calistoga, November 21, 1927, for 0.5 cubic foot per second from Troutdale Creek in section 35, T. 10 N., R. 7 W., for domestic and fish propagation in section 35. Estimated cost \$50.

TULARE COUNTY—Permit 2925, Application 5541; issued to Soda Flat Water Association, Porterville, November 28, 1927, for 0.005 cubic foot per second from unnamed spring in section 34, T. 20 S., R. 31 E., for domestic purposes in section 34. Estimated cost \$150.

VENTURA COUNTY—Permit 2922, Application 4481; issued to Frazier Mountain Park and Fisheries Company, Glendale, November 25, 1927, for 0.15 cubic foot per second from a cienega in section 1, T. 8 N., R. 20 W., for domestic purposes. Estimated cost \$2,000.

SAN DIEGO COUNTY—Permit 2918, Application 5684; issued to Evarose Griffin Lloyd, 1307 West Sixty-eighth street, Los Angeles, November 15, 1927, for 0.1 cubic foot per second from unnamed spring in section 22, T. 16 S., R. 1 W., for domestic and irrigation of 7 acres. Estimated cost \$1,000.

Applications for permit to appropriate water filed with the State Department of Public Works, Division of Water Rights, during the month of November, 1927.

SISKIYOU COUNTY—Application 5746; Bull Pine Mining Corporation, 1134 West Thirty-ninth street, Los Angeles, for 3.00 cubic feet per second from Rogers Creek tributary to Klamath River. To be diverted in section 11, T. 12 N., R. 6 E., H. M., for mining purposes. Estimated cost \$2,000.

Application 5747; Bull Pine Mining Corporation, 1137 West Thirty-ninth street, Los Angeles, for 3.00 cubic feet per second from Rogers Creek tributary to Klamath River. To be diverted in section 11, T. 12 N., R. 6 E., H. M., for power purposes. Estimated cost \$4,000.

Application 5750; C. L. Lewis, care of Allen & McNamara, attorneys, Allen Bldg., Yreka, for 0.62 cubic foot per second from Mill Creek tributary to Scott River. To be diverted in section 22, T. 43 N., R. 10 W., M. D. M., for irrigation purposes on 50 acres. Estimated cost \$500.

LASSEN COUNTY—Application 5743; Gotthard Diethelm, Chilcoot, for 0.13 cubic foot per second from unnamed spring tributary to Long Valley watershed. To be diverted in section 29, T. 22 N., R. 17 E., M. D. M., for mining and domestic purposes near point of diversion. Estimated cost \$5,000.

TRINITY COUNTY—Application 5748; M. A. Senger, Weaverville, for 40.00 cubic feet per second from North Fork Trinity River tributary to Trinity River. To be diverted in section 24, T. 35 N., R. 12 W., M. D. M., for mining purposes. Estimated cost \$40,000.

Application 5766; Grover Allen Gates, Hayfork, for 0.32 cubic foot per second from Little Corral Creek tributary to Hay Fork. To be diverted in section 14, T. 3 N., R. 7 E., H. B. and M., for irrigation and domestic purposes on 25½ acres.

MODOC COUNTY—Application 5764; The Red River Lumber Company, Westwood, for 55 cubic feet per second from Ash Creek tributary to Pit River. To be diverted in section 4, T. 38 N., R. 10 E., M. D. M., for power purposes; 3435 t.h.p. to be developed. Estimated cost \$250,000.

PLUMAS COUNTY—Application 5763; John Uhart, Carson City, for 0.97 cubic foot per second from Eureka Creek tributary to Feather River. To be diverted in section 12, T. 22 N., R. 11 E., M. D. M., for irrigation and domestic purposes on 77.6 acres. Estimated cost \$600.

SUTTER COUNTY—Application 5755; Sutter Basin Improvement Company, Robbins, for 21.05 cubic feet per second from West Dredger Cut of Sutter By-Pass tributary to Sacramento River. To be diverted in section 5, T. 14 N., R. 2 E., M. D. M., for irrigation purposes on 842.127 acres of rice. Estimated cost \$30,000.

Application 5754; Sutter Basin Improvement Company, Robbins, for 18.85 cubic feet per second from East Dredger Cut of Sutter By-Pass tributary to Sacramento River. To be diverted in section 13, T. 13 N., R. 2 E., M. D. M., for rice irrigation purposes on 753.91 acres. Estimated cost \$15,000.

NEVADA COUNTY—Application 5756; Wilson T. Allyn, 1617 O street, Sacramento, for 0.50 cubic foot per second from Rush Creek tributary to South Fork of Yuba River. To be diverted in section 32, T. 17 N., R. 8 E., M. D. M., for mining purposes.

EL DORADO COUNTY—Application 5752; Parnall Gold Mines Corporation, care of Clifton H. Wildman, C. E. O'Donnell Bldg., Placerville, for 2.50 cubic feet per second from Baltic Creek tributary to Camp Creek and Cosumnes River. To be diverted in section 14, T. 10 N., R. 13 E., M. D. M., for power purposes for mining machinery. Estimated cost \$1500.

Application 5753; Parnall Gold Mines Corporation, care of Clifton H. Wildman, C. E. O'Donnell Bldg., Placerville, for 7.50 cubic feet per second from Camp Creek tributary to Cosumnes River. To be diverted in section 15, T. 10 N., R. 13 E., M. D. M., for power purposes for mining machinery.

FRESNO COUNTY—Application 5757; Ernest Walling, 1314 Pacific-Southwest Bldg., Fresno, for 1.00 cubic foot per second and 50 acre-feet per annum from unnamed stream and dug wells, tributary to San Joaquin River. To be diverted in section 12, T. 10 S., R. 23 E., M. D. M., for irrigation and domestic purposes. Estimated cost \$20,000.

VENTURA COUNTY—Application 5751; Mrs. Maud M. Coker, R. F. D. No. 1, Box 359, Ventura, for 0.50 cubic foot per second, 40 acre-feet per annum, from Santa Ana Creek tributary to Ventura River. To be diverted in section 24, T. 4 N., R. 24 W., S. B. M., for irrigation purposes on 250 acres. Estimated cost \$20,000.

SANTA BARBARA COUNTY—Application 5745; Horace O. Ensign, Newport Beach, for 0.025 cubic foot per second from two unnamed springs tributary to Schoolhouse Canyon. To be diverted in section 21, T. 10 N., R. 28 W., S. B. M., for domestic purposes. Estimated cost \$1,200.

RIVERSIDE COUNTY—Application 5758; U. S. Forest Service, San Bernardino, for 0.016 cubic foot per second from unnamed springs tributary to no stream. To be diverted in section 18, T. 5 S., R. 3 E., S. B. M., for domestic purposes on fifty-two special use residence sites. Estimated cost \$1,600.

Application 5762; H. E. Weaver, care of Sarau & Thompson, attorneys, Citizens National Bank Bldg., Riverside, for 0.25 cubic foot per second from underground tributary to no stream. To be diverted in section 33, T. 2 S., R. 4 W., S. B. M., for irrigation and domestic purposes on 12 acres. Estimated cost \$500.

SAN BERNARDINO COUNTY—Application 5760; State of California, Department of Public Works, Division of Highways, P. O. Box 137, San Bernardino, for 0.01 cubic foot per second from a spring tributary to West Fork of City Creek. To be diverted in section 29, T. 2 N., R. 3 W., S. B. M., for domestic purposes.

Application 5749; Gustav G. Gocke, 301 Hermosa avenue, Long Beach, for 0.50 cubic foot per second from unnamed spring. To be diverted in section 32, T. 2 N., R. 2 E., S. B. M., for domestic and fish pond purposes. Estimated cost \$1,000.

Application 5765; Thos. E. Hunt, 322 S. Vendome street, Los Angeles, for 5 cubic feet per second and 20,000 acre-feet per annum from Rattlesnake Canyon and Arrastre Creek tributary to no stream. To be diverted in section 31, T. 4 N., R. 3 E., S. B. B. and M., for irrigation and domestic purposes on 9860 acres. Estimated cost \$225,000.

LOS ANGELES COUNTY—Application 5761; John Boyle, care of W. C. Petchner, 725 Title Insurance Bldg., Los Angeles, for 15,000 acre-feet per annum from Littlerock Creek tributary to Antelope Valley drainage. To be diverted in section 27, T. 5 N., R. 11 W., S. B. M., for irrigation and domestic purposes on 5000 acres. Estimated cost \$50,000.

Application 5759; F. H. Hoepfner, 602 Atlantic boulevard, Bell, for 0.4 cubic foot per second from springs and underground water tributary to Deadman Canyon. To be diverted in section 21, T. 6 N., R. 14 W., S. B. M., for irrigation and domestic purposes on 40 acres. Estimated cost \$1,500.

SAN DIEGO COUNTY—Application 5744; Arthur H. Nightingale, 1207½ Tamarind avenue, Los Angeles, for 3 cubic feet per second from two springs in Palm Canyon tributary to San Felipe Creek, to be diverted in section 26, T. 10 S., R. 5 E., S. B. M., for irrigation and domestic purposes on 250 acres in sections 25 and 36, T. 10 S., R. 5 E., S. B. M. Estimated cost \$5,000.

SENATOR ODDIE URGES FEDERAL AID FOR ROADS

(Continued from page 21.)

sections, the installation of traffic signals, and the construction of additional highways as entrances to the large cities. The last is a problem that will shortly have to be faced in the environs of practically all large cities.

Our highways, laid out in the days of horse-drawn traffic of low density, converge as they approach most of the cities and discharge their heavy burdens of modern traffic collected from wide areas into a few already congested city streets. Modern traffic conditions demand a separation of these old-fashioned converging city approaches.

Instead of merging the highways as they draw near the cities, their number should be multiplied in order to distribute the traffic over a greater number of streets and to permit it to enter the city at points as near as possible to the destinations of the vehicles.

These are a few of the problems that will occupy eastern road builders and call for continued expenditures indefinitely in the east.

A proclamation issued in 1622, by King James I, ruled that only vehicles of not more than two wheels, drawn by not more than five horses, were to be allowed on certain roads in England, and all loads were not to exceed 2000 pounds.

Ruling Defines Federal Aid to Town Highways

Federal aid for highway construction within municipalities having a population of 2500 or more is not authorized except for a distance not exceeding the mile within the corporate limits on a particular highway, along which, for the entire mile, the houses average more than 200 feet apart, exclusive of the width of the houses.

This ruling has just been made to the Secretary of Agriculture by the Comptroller General of the United States, J. R. McCarl, with regard to a federal aid project at Stamford, Texas.

Mr. McCarl in his ruling also defined the proper method to be followed in determining the eligibility for federal aid of any portion of a municipal highway, in accordance with statutory limitations.

On this point the ruling reads:

"The phrase 'except that portion of any such highway or street along which within a distance of one mile the houses average more than 200 feet apart' obviously has reference to the conditions along an entire mile of the highway where any portion of that mile is proposed to be aided. The purpose of the exception was to allow federal aid in highway construction through the sparsely built up sections of municipalities and the test specified by the statute is whether there is such a lack of houses that in an entire mile of highway they average over 200 feet apart."

Analysis of Accidents at Grade Crossings is Made by Railroad Board

An analysis of grade crossing accidents occurring on twenty-four railroads in California from January 1, 1925, to May 10, 1927, has been made by the State Railroad Commission. The 2251 accidents analyzed were as follows: On crossings protected by crossing signs, 946; by wigwags, 654; by human flagmen, 290; by overhead crossing signs, 293; by gates, 34; by crossing bells, 34. These 2251 accidents resulted in 297 persons being killed and 1054 injured. Property damage only occurred in 1360 accidents.

Safety Campaign Progress.

Nearly 200,000 persons have pledged themselves to use courtesy and caution on the highways during the coming year, the American Road Builders' Association state.

"This 200,000 includes only those persons who have actually signed courtesy and caution pledges, and does not incorporate the members of some 5000 civic clubs, 10,000 churches, students of schools and automobile clubs throughout the nation who adopted the pledge in a body," the association stated.

SAN GABRIEL WATER PROBLEMS

(Continued from page 6.)

Valley. Rainfall on the valley floor approximates 18 inches on the average and the surrounding hills contribute a water supply.

When it leaves the mountains the river passes over a very coarse detrital mass which absorbs water readily. This percolating water, together with water which percolates from the tributaries and percolation from the rainfall, reaches the underground waterplane. The principal water supplies of the valley are derived by pumping from the underground water reservoir and this, of course, is supplied by percolation as above noted. As the underground water drifts south or downstream in the valley, it meets the southern range of hills and is forced to the surface, so that there is maintained a perennial stream of rising water at Whittier Narrows which is diverted by various companies. Below the Narrows is another percolating area which terminates about 5 miles below the point of maximum rising water. From there to the ocean, which is about 15 miles below, little or no percolation takes place and all water reaching that point flows practically undiminished to the ocean.

San Gabriel Valley slopes rather steeply from the mountains and hills on all sides toward the river and the Pass. The length of the valley is east and west, while the river flows southwest 13 miles across the width of the valley and is at the bottom of the broad trough of the valley except at its debouchure from the mountains where a cone has been built up slightly higher than land on each side. The waterplane slopes in the same direction as the surface, although less steeply and consequently the waters of the river which percolate can not extend laterally to all parts of the valley but involve an area of less than 60 square miles in the central part of the valley. In addition to this slope of the waterplane from all sides to the Narrows there are, along or near the foothills, underground formations—dikes and faults and alluvial unconformities—which hold the waterplanes in some cases as much as 250–300 feet higher above than below. Raymond Dike on the west is the most noteworthy of these. Above it there are more than 30 square miles of habitable area largely occupied by Pasadena and Sierra Madre.

COASTAL PLAIN

Below the Narrows the Coastal Plain is essentially similar in formation to the valley, as there is a barrier range of hills near the ocean paralleling the other hills and holding the water back. Because of its flatness it is

much more difficult to outline the area to which San Gabriel River water flows underground. It is possibly in the neighborhood of 100 square miles. It should be understood that San Gabriel River water, that is, water issuing from San Gabriel Canyon, is not the only water affecting this area or that similarly designated in San Gabriel Valley. It has been amplified and diluted by tributary percolation, by rainfall on the valley floor and by the waters coming in from all sides which have other sources. Nor are the overlying land-owners the only users from this area, as water is exported to perhaps 50 square miles in both the valley and the plain.

RAINFALL RECORDS

Rainfall records for the past 50 years and run-off records for 31 years indicate that for the 50-year period at least, precipitation has had a cyclic variation, the period being 22–24 years. Ten to 12 years, most of which were above normal, have been followed by 10 to 12 years in which most of the years were below normal. The waterplane fluctuates with the season and also with the cycle. The last dry cycle ended in 1904, after which water levels rose until 1916, when a dry cycle again set in. The lowest point reached was in 1926 over most of the valley. Except in two areas not affected by San Gabriel River, levels have risen since then. In the central part of the valley, water levels were seven feet lower in 1926 than in 1904, while in those parts not affected by San Gabriel River the decrease was much greater. In the Coastal Plain the decrease was in general greater than in central San Gabriel Valley.

RESERVOIR CONSTRUCTION

Prior to 1923 Los Angeles County Flood Control District had constructed three reservoirs on the headwaters of three of the smaller streams in the valley. In 1924 a bond issue of approximately thirty million dollars was authorized for construction of additional reservoirs of which two have been completed, one is under construction, and the largest, on San Gabriel River, is not yet started. These reservoirs will so modify the flow that more water will be caused to percolate in the stream bed in crossing the valley. They will also be used for direct conservation by holding over water stored in them.

PASADENA APPLICATION

In 1923 the city of Pasadena made application for permit to construct a reservoir in San Gabriel Canyon and a conduit leading to the city. An investigation was started in that year by the Division of Water Rights to determine the amount of water flowing into

the ocean. After four years' investigation it was believed that enough information had been gathered so that the division could pass intelligently on this as well as the applications of numerous other cities for diversion which had been made in the meantime, and the hearing noted in the first paragraph was held.

Only the summer or normal flow from the canyon is used directly. The winter run-off is characterized by wild and dangerous floods impossible to divert and of a very flashy nature. Their menace may be judged by the fact that the flood control district was formed and that expenditures so large as above noted have been authorized for their control.

WORK OF DIVISION OF WATER RIGHTS

The work of the Division of Water Rights has consisted largely of measuring the river and tributaries at strategic points to determine the percolation which naturally occurs with different stages of the river. Observations cover a wide range of discharge. The highest day's discharge on which a record of percolation was secured has been exceeded only three times in the 31 years of record and from this maximum many observations were secured at various stages down to the point where the entire discharge percolated.

The facts as to run-off during the four seasons covered by the investigation may be briefly summarized: In 1923-24 the mountain run-off was 18 per cent of normal; in 1924-25, 15 per cent of normal; in 1925-26, 70 per cent of normal; and in 1926-27, 84 per cent of normal. The average for the four years has been 47 per cent of normal. Waste of San Gabriel Canyon water from the valley during the four years has averaged 22,000 acre-feet, being almost negligible in the first two years and approximating 42,000 acre-feet in each of the last two years. The waste of San Gabriel Canyon water into the ocean has averaged approximately 20,000 acre-feet annually during the investigation. In addition there has been other waste from tributaries and from rainfall on the valley floor but this does not enter materially into the issues involved.

From the measurements made on the stream a curve has been drawn showing the relation between each day's average discharge coming from San Gabriel Canyon and the percolation which occurred with that particular flow.

WATER LEVELS

Water levels in the valley are lower than at the beginning of the investigation, but began rising in 1926 with a 70 per cent run-off from

the mountains, except as before noted in two areas not affected by San Gabriel River water.

DISPUTE JURISDICTION

At a hearing on applications made to the Division of Water Rights for diversion from San Gabriel River, held in Los Angeles on November 14-15, the principal protestants who were not also applicants disclaimed authority of the division and presented no evidence. Some of the applicants who were also protestants against other and prior applicants denied the authority of the division, but at the same time requested that their applications be considered. These presented no evidence. One applicant was undecided whether to allege lack of jurisdiction by the division or not and did present evidence through witnesses. A fourth group, the principal and prior applicants, foothill towns on the west side of the valley, presented their case in the usual manner.

From the diverse positions assumed by these various parties, it is evident that there is uncertainty concerning the legal aspects of the case and in fact, as will be found from a close reading of the list of questions involved, at the close of this article, some of the issues are unprecedented in water litigation. It is the purpose of this article not to discuss the legal situation but to point out the issues involved. Before doing so a brief description of the physical situation is in order as is also some of the history of the case.

The questions printed in the fore part of this article were raised either directly or indirectly at the San Gabriel hearing, or in briefs submitted prior to the hearing. Those applicants which protested the authority of the division but which at the same time elected to maintain their applications are those who believe themselves, because of location, to be benefited more if the stream, regulated by flood control reservoirs, is allowed to follow its natural channel with no adverse diversions, than by granting their applications subsequent to prior applicants. Those who maintained their applications in the belief that the jurisdiction of the division is not in question are those widely separated from the stream. The protestants which withdrew are water companies lying mostly within the area influenced more or less by San Gabriel River water or exporting from that area.

"What are you doing here?" asked a policeman of a woman who had stopped her automobile near a street corner and was preparing to alight.

"Parking my car," she replied. "I thought this would be a good place. The sign there reads, 'Safety Zone'."

California Leads U. S. In Revenues Derived From Tax on Gasoline

California led the states in the amount of revenue derived from a tax on gasoline during the first half of 1927, the Bureau of Public Roads of the Department of Agriculture has just announced.

The following table, prepared by the bureau, shows the rate of taxation in cents per gallon in the various states and the revenue derived by each state from a gasoline tax during the first six months of 1927:

	Tax rate on June 30	Rev. for first half 1927
Alabama -----	4	\$2,653,637
Arizona -----	3	518,599
Arkansas -----	5	1,560,559
California -----	2	9,035,934
Colorado -----	3	1,194,077
Connecticut -----	2	1,307,024
Delaware -----	3	267,091
Florida -----	4	5,355,217
Georgia -----	3½	3,071,528
Idaho -----	4	606,694
Illinois -----	0	-----
Indiana -----	3	4,564,711
Iowa -----	2	2,777,183
Kansas -----	2	1,891,245
Kentucky -----	5	2,472,015
Louisiana -----	2	1,411,554
Maine -----	3	742,925
Maryland -----	4	1,774,442
Massachusetts -----	0	-----
Michigan -----	2	5,033,798
Minnesota -----	2	2,274,327
Mississippi -----	4	2,136,296
Missouri -----	2	2,921,065
Montana -----	3	428,363
Nebraska -----	2	1,470,084
Nevada -----	4	199,497
New Hampshire -----	3	413,581
New Jersey -----	0	-----
New Mexico -----	5	614,200
New York -----	0	-----
North Carolina -----	4	3,932,544
North Dakota -----	2	395,933
Ohio -----	3	7,539,826
Oklahoma -----	3	3,196,376
Oregon -----	3	1,613,209
Pennsylvania -----	2	6,101,696
Rhode Island -----	2	300,971
South Carolina -----	5	2,210,636
South Dakota -----	3	960,630
Tennessee -----	3	1,983,139
Texas -----	3	5,975,553
Utah -----	3½	567,794
Vermont -----	3	275,536
Virginia -----	4½	3,122,518
Washington -----	2	1,631,226
West Virginia -----	3½	1,416,057
Wisconsin -----	2	2,526,058
Wyoming -----	3	256,908
District of Columbia -----	2	548,605

Total----- \$101,250,841

Two-cent tax rates were effective in Illinois on August 1, 1927, and in New Jersey on July 1, 1927.

"Quit Your Shoving."

[From the *Christian Science Monitor*.]

"Quit shoving," the highway said to the hillside, but the hillside kept right on pushing until it tumbled a considerable section of the road over a 100-foot cliff and onto the railroad tracks below.

The road was an important one, leading to the huge Carquinez Straits bridge a short distance west of Crockett, so the Division of Highways proceeded to smooth off the slope by hand, somewhat reduce its extreme pitch, and then spread out an acre of "gunite," a type of concrete, over the offending area of shifting sand. The gunite was pumped through a hose to the spot. The measure was successful, and the hillside has ceased to harass the highway further.

Permission has been granted by the Railroad Commission to California Highway Commission to construct the state highway at grade across a spur track of Central California Traction Company north of Stockton, San Joaquin County.

A crew of men under the direction of the California Highway Commission transplanted shade trees along the highway between Proberta and Red Bluff in preparation for the widening of the roadbed from 20 to 30 feet. The trees varied from 10 to 18 feet in height.

If you work for a man, in Heaven's name work for him. If he pays you wages that supply your bread and butter, work for him, speak well of him, and stand by him and the institution he represents. I think if I worked for a man, I would work for him. I would not work for him part of his time, but all of his time. I would give my undivided service or none. If put to the pinch, an ounce of loyalty is worth a pound of cleverness.

If you must villify, condemn, and eternally disparage, why resign your position, and when you are outside damn to your heart's content.

But, I pray you, so long as you are a part of an institution, do not condemn it. Not that you will injure the institution—not that—but when you disparage the concern of which you are a part, you disparage yourself.—*Elbert Hubbard*.

No other state has such a combination of size and varied attractiveness as has California. No other state has large population centers so widely separated. In no other state of large population is the saturation point in vehicle registration so near. In no other region is the average motor vehicle driven so far each year.—*The Highway Magazine*.

Noting that cholera killed 1,500,000 pigs in this country last year started us wondering if there isn't some way of giving cholera to road hogs.

Beside the filling station now
The village smithy stands.
And many dollars fall into
His large and sinewy hands.

—*Florida Times-Union*.

Insurance Agent: "Come with me, you can get damages for this."

Negress (hit by truck): "Good Lawd, man, ah don't need no mo' damages. What ah needs is repairs."

ROSTER
DEPARTMENT OF PUBLIC WORKS
STATE OF CALIFORNIA

C. C. YOUNG, *Governor*

B. B. MEEK, *Director, Department of Public Works*

CORNING DE SAULES, *Deputy Director, Department of Public Works*

GEORGE C. MANSFIELD, *Editor, California Highways and Public Works*

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of
HIGHWAYS

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Eleventh and P Streets, Sacramento, California.

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Pacific Highway along Klamath River, Siskiyou County.

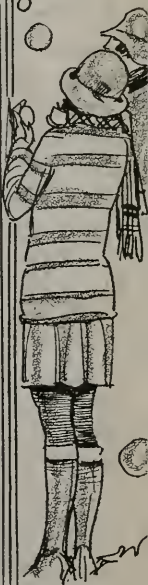


State Highway near Pine Valley, San Diego County.

California Highways and Public Works

Official Journal of the Department of Public Works
State of California

JANUARY
1928





Overhead crossing at Pismo Beach, San Luis Obispo County.

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Big Lagoon Trestle, Humboldt County.



One source of summer water supply. View of snow covered mountains in Mono County, showing a movie outfit on location caught in snow.

Outstanding Water Issues in State As They Developed in the Past Year

By EVERETT N. BRYAN, Deputy Chief of Division of Water Rights.

THE ACTION taken by the United States Supreme Court in the *Herminghaus* case, the passage of Assembly Constitutional Amendment No. 27, and the appropriation of water by the Department of Finance under Chapter 286, Statutes 1927, in furtherance of the so-called coordinated plan for the development of California's water resources were three outstanding events during 1927 affecting water rights.



EVERETT N. BRYAN.

THE HERMINGHAUS CASE

By its action in the *Herminghaus* case the United States Supreme Court indicated that it did not deem the controversy in California over riparian and appropriative water rights invoked a federal jurisdiction. This decision blasted whatever hope may have existed that relief might be found through the federal courts from the blighting effect upon development of California's water resources effected by the *Lux* vs. *Haggin* decision and the train of decisions following which terminated in the now famous

case of *Herminghaus et al. vs. Southern California Edison Company*. It became plain that within the state itself must be found whatever relief was to be had from a situation which made the favored land owners bordering the streams of California the absolute owners of the water flowing therein, except in so far as prescriptive rights had already been acquired by others. This decision makes



Lost Creek Dam of Oroville-Wyandotte Irrigation District.

those landowners bordering streams flowing under such conditions as San Joaquin River the absolute owners of the water flowing therein, except in so far as prescriptive rights had already been acquired by others.

PROPOSED CONSTITUTIONAL AMENDMENT

Popular apprehension of this fact led to the enactment of Assembly Constitutional Amendment No. 27 which will be submitted to the electors at the general election next November.

By this constitutional amendment it is proposed that the people of California shall declare "that because of the conditions prevailing in this state the general welfare requires that the water resources of the state be put to beneficial use to the fullest extent of which they are capable and that the waste or unreasonable use, or unreasonable method of use of water be prevented." In other words it is proposed not to take away from the riparian owner his right to use water but that he shall be governed in his use of water by considerations as to reasonableness of use as is the appropriator.

STATE FILINGS

It is a generally recognized fact that geographically speaking also California's water resources are not evenly distributed throughout the state. In certain portions of the state there is an over-abundance of water. In other portions there is a deficiency. If the fullest practicable development of the state's water resources is to be realized it is imperative therefore that some system be evolved whereby the earlier developments will be prevented from placing any unnecessary obstacles in the way of those developments which are to follow. Chapter 286, Statutes 1927, was therefore enacted by the legislature enabling the Department of Finance to make such appropriations prior to May 29, 1928, as in the judgment of that department are or may be "required in the development and completion of the whole or any part of a general or coordinated plan looking towards the development, utilization or conservation of the water resources of the state." Pursuant to this enactment there were filed with the Division of Water Rights by the State Department of Finance on July 30, 1927, twenty-five applications for agricultural and power purposes affecting forty-two different streams.

TWO CHIEF PROBLEMS

Fortunately for the State of California it has but recently passed through an era of unprecedented water resource development and existing programs for further development of both power and agricultural projects are well in advance of present needs. As a result the state now finds itself in a position where it may safely pause for a moment to work out a solution of the two difficult water problems with which it is confronted—*i.e.*, how best to dispose of the riparian rights question, and how best to lay a sane and appropriate foundation for the ultimate fullest possible realization of the bounteous water resource development of which the state is capable.

APPLICATIONS RECEIVED & ACTIONS SHOWN BY ANNUAL TOTALS

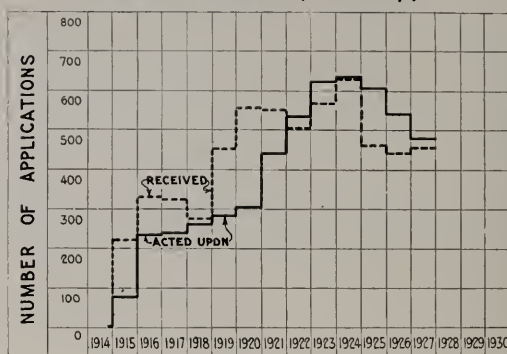


PLATE 1.

SECOND-FEET APPLIED FOR AND ACTED UPON SHOWN BY CUMULATIVE TOTALS

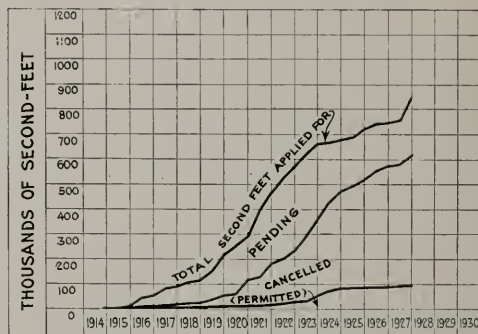


PLATE 2.

WHAT PLATES SHOW

The feverish activity in all lines of development during the years 1919 to 1923 included many large appropriations. Activity in smaller appropriations persisted during 1924 but since that time—until the large appropriations by the state were made in July, 1927—the activity in appropriations has continued more along the lines of a pre-war basis. These facts are well illustrated by analysis of plates 1 and 2.

Examination of the graph on Plate 1 indicates the reduction in rate of receipt of applications since 1924 and also the uniformity of rate of receipt since that time. It indicates furthermore that since 1922 actions have exceeded receipts, and a consequent reduction in the number of pending cases has resulted.

The inclination of the curve showing "total second-feet applied for" on Plate 2 indicates the rate at which appropriations have been made in terms of second-feet. The rapid rate

(Continued on page 28.)

State Highways Need State Vision

Commissioner Baumgartner Gives his Job the Once Over

By J. P. BAUMGARTNER, Member of the California Highway Commission.

“**W**ITHOUT vision, people perish.” Likewise, without vision, no big long-drawn-out job can be well done. And even vision doesn’t help much in public work unless the public as well as its employees get the vision. However much vision former highway commissions may have had, they have been seriously handicapped because either the people or their legislative representatives have not had the vision, or at least have not been successful in translating the vision into practical results in the way of providing an adequate and continuous flow of funds for highway work. Perhaps none of us at any time has looked far enough ahead or ever realized the tremendous growth in population and traffic that has come and is still coming.

Under the hitherto stop-and-start, never-know-what-to-expect-or-rely-upon system of financing, the California Highway Commissions of the past have done wonders, and the people of California should join the present Highway Commission in expressing its gratitude for what has been accomplished.

The job that this particular Highway Commission has on its hands is to plan for and at least make a good beginning toward the completion of the system of state highways to which the commonwealth is both morally and legally committed.

A large part of this commitment dates back many years, even to the beginning of state highways in California—that is to say, many state highways provided for by the first issue of state highway bonds have not yet been constructed. Only a little more than half of the 6500 miles of state highways provided for by the three bond issues and by

legislative action have been graded, and less than half have been paved. So it may readily be seen that the present Highway Commission and its successors for several years to come will have their hands full.

What the present Highway Commission mainly has been trying to do during the past year is to find out just what its job is and how best to do it. Of course it has also had to take care of a large amount of maintenance, reconstruction and new construction work. But owing to the practical exhaustion of funds available for new construction, and the fact that maintenance and, to some extent, reconstruction go on somewhat automatically through the engineering department, the Commission has been enabled to make a pretty thorough physical survey of the state highway system, and to study financial, engineering, population, traffic and other problems involved.

The Commission has felt that if it could plan and program pretty definitely the work to be done during its official incumbency, it would thereby establish a precedent of order, system and equitability that would not only mark its own administration with a fair degree of efficiency, but

would greatly smooth the pathway for succeeding highway commissions. To that end the Commission has conscientiously striven to vision the whole tremendous job of completing the entire system of state highways, and to have the public share that vision. Nor has it stopped there; it has looked far into the future and tried to visualize, with some measure of practicability, an adequate state highway system for a population and an industrial and social development approaching the saturation capacity of the Pacific coast.



J. P. BAUMGARTNER.

A good start on this work of plan and program has been made by the budget and allocation schedule under consideration by the Commission at the time this article is written, and which, no doubt, will have been officially revised, adopted and made public before this article is published.

In addition to this careful budgeting and allocation of a total revenue of \$15,100,000 for new construction during the seventy-ninth and eightieth fiscal years, it is my personal understanding and belief that the Commission has fully decided, with the hearty approval of the Director of Public Works, that it will try very hard to do certain things and that positively it will not do certain things.

It will exert every effort, consistent with good engineering and construction principles, and in proportion to the funds available, to begin to finish the state highway system as originally planned in the 1909 bond issue and succeeding measures.

It will build state roads only, and will not add or sanction—nor permit if it can prevent—the addition of other roads to the state system until all those now in the system have been built. Of course that will not be in our official day but we may reasonably hope and believe that there will be better men than we are to “carry on” when we beyond the official vale have passed.

Precedence in the order of road building will mainly be governed by present and prospective traffic requirements and necessities, rather than by ancient legislative action, though that is not saying that no consideration whatever will be given to existing theoretical obligations.

No state roads will be built on inadequate rights of way, and the yardstick by which adequacy is measured will be as long as the span of future years that human judgment can reasonably compass.

State roads in future will seek to avoid passing through cities and towns, and will strive towards the ideal of straight lines. Certainly they will not be turned and tortured and twisted by political or personal pull, or diverted by sectional rivalry or jealousy. They will not side-step heavy grading or expensive rights of way for the sake of immediate apparent economy at the expense of ultimate real economy. Under present and prospective traffic conditions often the road that costs the most is the most economical.

This enumeration might be extended indefinitely by going into details, but as it is, after all, mainly an expression of my own opinion—though I believe it is, essentially, also a fair interpretation of the attitude of

the Highway Commission and the Director of Public Works—it may well be ended without further elaboration.

One of the discouraging aspects of highway commission work has been—and, to a large extent, still is—the difficulty, almost the impossibility, of getting the average citizen to look far enough ahead or even to see the whole of the present picture. The Commission is absolutely deluged with requests, petitions, resolutions, even demands, on behalf of projects largely, and sometimes wholly, of a local character; and even when projects of state-wide importance are presented it is painfully apparent, in most instances, that the spotlights turned upon them are fueled almost wholly with the oil of local selfishness.

While it is notably and encouragingly true that many of those with whom we come in contact on tours of inspection and in public meetings are broadminded and fair in their attitude, and can and do bring themselves sincerely to the point of view that the interests of state-wide and interstate traffic are, in the last analysis, paramount to and promotive of the interests of local traffic, they are not aggressive, insistent and initiative, as are those who are obsessed with the conviction that the road that runs past their front gate is the most important road in the state. Until the broadminded view becomes more general and more aggressive, the Highway Commission will have a hard row to hoe; for it is thoroughly and irrevocably and completely committed to the proposition that state highways shall be really and truly what their name implies, and shall be planned and constructed with the interests of the entire state in fair and equitable comprehension.

Another factor in the problem of highway construction that must be clearly revealed to and comprehended by the public is that it costs about four times as much now as it did in the early days of state highways to construct a mile of road. In other words, we can now construct only one mile of highway with the money that used to construct four miles. For not only do labor and materials cost much more but roads must be wider and stronger and straighter and more nearly level to meet present day necessities, not to say demands, of traffic.

And this brings up another point on which the public should get the right point of view. Over and over the complaint comes to the Highway Commission that this or that road was provided for in this or that bond issue and has not yet been built. Superficially

The Highway Right of Way: How Wide Should It Be and How Should the Width Be Utilized?

By T. H. DENNIS, Acting Maintenance Engineer, California Division of Highways.

THE DEVELOPMENT of California's highway system has been marked by new problems periodically arising and frequently the result of the traffic that the roads themselves have created.



T. H. DENNIS.

Today probably one of the most important of these problems has to do with the proper width of the highway right of way, and its correlated problem, the proper utilization of that width.

This article has to do with the promise that the eighty-foot right of way offers for both

pavement development and adequate space reservation for trees, sidewalks and pole lines.

Let it be first noted that the eighty-foot right of way provides a pavement space between curbs that will permit of fifty-six-foot pavement developments.

This in turn provides for four ten-foot traffic lanes with an eight-foot space on either side reserved for parking. This parking space can also be utilized for the installation of underground service utilities. Their frequent installation and inspection at this location will present less interference with both auto and pedestrian traffic.

Based on the assumption that a four-lane road will carry approximately three thousand vehicles per hour and that the peak represents 10 per cent of the sixteen-hour traffic, this design should satisfy all but a few locations adjacent to the larger population centers, at which points possibly a parallel road would be necessary.

In the design trees are placed adjacent to the curbs, power and telephone poles at the right of way boundary, the space between being reserved for sidewalk purposes. While the relative position of the poles and trees and the proposed height of their development has

The proper utilization of the highway right of way to provide for the ultimate development dictated by traffic, and the accommodation of encroachments more or less associated with this development, such as trees, pole lines and service utilities, should be definitely determined.

The necessity and importance of this step will be understood when it is realized that present studies indicate traffic will more than double within the next fifteen years and that approximately 90 per cent of our right of way does not exceed sixty feet in width.

The design adopted should not only satisfy the major requirements, but the locations of the various factors in it should be along such lines and grades as will permit their inclusion when additional rights of way become necessary.

The determination of where additional rights of way are necessary should be made at once, as it is not unreasonable for an abutting property owner to require our plan of design in order that he may build with the assurance that his improvements are permanent.

invited the objections of various pole companies, I believe the design is sound, being dictated both by economic and aesthetic reasons.

The designation of our highways as boulevards by the various counties has done much to expedite the movement of traffic and it is hoped the adoption of this ordinance will become uniform as its general observance by drivers indicates its soundness.

The installation of gasoline pumps is no longer permitted within our right of way, as it invites congestion of traffic with its attendant hazards.

Signs within our right of way should be limited to warning and directional, their uniformity of type and location being such as to invite the driver's immediate attention and observance.

The growth of small business adjacent to our highways, while it astonishes, is no more than the natural trend induced by this traffic. Here each owner is a potential merchant, who, without the obligation of service, freights or rents, can market his products to customers who drive past his door. Competition is keen and advertising signs often

(Continued on page 15.)

The New Women's Penitentiary

By GEO. B. McDougall, Chief of the Division of Architecture.

ALL female prisoners of the state are detained at San Quentin. Due to the entire inadequacy of the quarters for women originally provided there, provision was made for the construction of the present women's building which was completed and occupied about the middle of 1927.

So far as I have been able to learn this building is unique, there being no other such building in the country. There are federal and other penal institutions for women in the nature of industrial farms for women, but these are entirely independent and rather large institutions, housing inmates to the number of several hundred. The number of female prisoners at San Quentin is about 90 and this is the largest number the state has at any time had. The capacity of the women's building is sufficient to house about 120 inmates.

IS SEPARATE PRISON

So far as management and control are concerned, the women's building is a part of the State Prison at San Quentin which practically eliminates special overhead expense from the cost of its maintenance. Notwithstanding this the building is so placed on prison property as to be wholly separate from the remainder of the prison, as completely so as if it were located in another county, and is so planned as to building itself and its surroundings as to be entirely self-contained.



JAMES HOLOHAN,
Warden of San Quentin.

TYPE OF CONSTRUCTION

Due to the limited ground area available for its site, it was necessary to make the building as compact as possible. It is three stories in height and its over-all dimensions are about

125 feet by 142 feet. Its architecture is Renaissance, its appearance being pleasing notwithstanding an entire absence of any elaborateness of treatment. It is dignified and not severe, the only exterior evidence of its actual character as a prison being the steel



Front view of Women's Prison at San Quentin.

bar grilles in the openings. The building is what the San Francisco building ordinances describe as "Class B" construction. It has a reinforced concrete skeleton frame and reinforced concrete walls and floors including the ceiling of the third story. The main roofs are covered with slate. It is therefore of entirely permanent materials and so far as it is possible to make a building so, is fire and earthquake resisting. The building is so planned that all areas throughout are abundantly supplied with daylight, sun, and natural ventilation. The artificial heating and also steam for heating water are supplied by the boiler plant of the main institution.

There is no basement except a comparatively small area required for mechanical equipment.

ARRANGEMENT OF BUILDING

The first floor has two entrances from the outside, one in front and the other in the rear, the former for the admission of the public and of new inmates and the latter for the ingress and egress of the inmates and for the bringing in of necessary supplies. Adjacent to the main front entrance are six rooms for administrative purposes: a visiting room,

(Continued on page 31.)

Women Prisoners of San Quentin

IS THERE any distinctive criminal type among women?

What are the animating causes that lead to crime among women?

What do women prisoners most need?

These are the questions asked of Miss Josephine Jackson of the women's new prison at San Quentin, where women convicted of felony in California are incarcerated. For eleven years she has been superintendent in charge of the women prisoners at San Quentin. She has seen them come and go, talked to them and counseled with them, and knows as no other woman in the West the psychology of the woman prisoner. And here are some of her conclusions:

"There is no criminal type among women prisoners," says Miss Jackson. "They present no peculiar psychology. Crime among women generally follows an uncontrolled impulse, in which the women leave the usual path of life, make a detour into crime, without thought of the results that follow."

The predominant influences that leads to crime among women, Miss Jackson asserts, are two: First, love of finery, leading to larceny, embezzlement, or some crime involving an attempt to get money to buy the coveted finery; and second, revenge springing from jealousy.

Here are some further observations Miss Jackson makes:

Women prisoners are generally docile and there is no discipline problem among them. They show a great love for flowers, and are exceptionally kind to animals. They like to adorn their cells with curtains, pictures, and such ornaments as they can obtain.

On the other hand these same women will show an astonishing calmness in talking of the crimes that they have committed. She accounts for this in that the various preliminaries that precede their trial and the trial itself have accustomed them to the story and to a

certain extent calloused them to its details.

What the women of San Quentin chiefly need is work. And they plead for industries that are colorful and interesting. Such indus-



Miss Josephine M. Jackson, Superintendent of Women's Prison.

tries reawaken pride in the prisoners while drab industry deadens it.

Many of the women who come to San Quentin are girls who, for one reason or another, leave their homes at an early age, and start to drift around the country, working at various employments. Few of the professionally immoral type, she declares, are found in the penitentiary. This class is found more frequently in the county and city jails.

Most of the women prisoners who are released upon parole make good.

Just as the average age of the male prisoner is less than a few years ago, there has been a tendency for increasing crime among girls and young women. Thus on December 1, 1927, the women prisoners in San Quentin were classified as to age as follows: Under 20 years, 2; 20 to 24 years, 12; 25 to 29 years, 19; 30 to 34 years, 21; 35 to 39 years, 14; 40 to 44 years, 8; 45 to 49 years, 9;

(Continued on page 12.)



Interior view of cell in Women's Prison.

California's First Complete Highway Budget and Program

THE California Highway Commission at its meeting on January 12th adopted the budget for highway construction, reconstruction and widening for the biennial period extending from July 1, 1927, to June 30, 1929.

The Department of Public Works was requested by the California Highway Commission to prepare a budget for the allocation of \$1,000,000 federal aid money, this budget to be presented at the next meeting of the Commission, and to be accompanied by an opinion of Attorney General U. S. Webb as to the legality of its allocation. This budget is to contain \$350,000 for the Skyline boulevard and a proportionate allocation to southern California roads under the percentage requirement of the Breed bill, as follows: San Diego-El Centro, Mecca-Blythe, Daggett-Needles, Mojave-Bishop.

The budget thus adopted becomes the program for highway construction activities for the period it covers. It marks the first time in the history of California that a complete program of highway construction activities has been adopted and made public prior to the execution of the program.

The budget includes new construction projects made possible through the one-cent gasoline tax bill passed by the last legislature and approved by Governor Young. The first revenues available under this bill were paid into the state treasury in December. It also incorporates the widening and reconstruction budget adopted by the 1927 legislature, the projects in which are payable from the state's share of the previously enacted two-cent gasoline tax.

The allocation of construction funds payable from the one-cent gasoline tax funds is made under the terms of the Breed bill. The total revenue that it is estimated will be derived from this bill for the period of the biennium is \$15,100,000. The maintenance, widening and reconstruction program involves total estimated expenditures of \$27,100,000.

In addition to this, revenues derived from repayment on federal aid projects will be

devoted to convict camp work. The amount of federal aid thus received during the biennium is estimated at \$4,969,412. No specific allocation of funds to convict camp projects has been made, but it is planned to maintain convict camps on the following highways:

Trinity lateral; Red Bluff-Susanville-Purdy lateral; Redding-Alturas lateral; Tahoe-Ukiah highway (Lake County); Yosemite lateral; Carmel-San Simeon highway (Monterey County); Feather River lateral; Kings River Canyon and Ridge Route relocation.

Money will be allocated to the convict camps from time to time as the need develops and the work progresses.

The estimated total of highway expenditures for the biennium (July 1, 1927, to June 30, 1929), from all funds and including all purposes accordingly is \$47,169,512.

The California Highway Commission has allotted the \$15,100,000 that it is estimated the one-cent gasoline tax will raise during the biennium, to new construction projects, in northern and southern counties under the percentage terms prescribed in the Breed bill as follows:

Northern Counties.

For primary road projects (54.7% of 75% of money raised under bill) --	\$6,194,775 00
For secondary road projects (50% of 25% of money raised under bill) --	1,887,500 00
Total for north-----	\$8,082,275 00

Southern Counties.

For primary road projects (45.3% of 75% of money raised under bill) --	\$5,130,225 00
For secondary roads (50% of 25% of money raised under bill) -----	1,887,500 00
Total for south-----	\$7,017,225 00

The Commission also instructed the secretary to inform city officials of San Diego that if that city would obtain rights of way and grade the Rose Canyon road to state standards the state would pave such road.

The budget was presented to the California Highway Commission by B. B. Meek, Director of the State Department of Public Works.

Issues Involved in Highway Budgeting: Traffic Pressure or Political Pressure—Which?

By C. C. YOUNG, Governor of California.

FOR THE FIRST TIME in the history of California, a budget is being published in which a complete biennium's program of new highway construction is mapped out in advance of any call for bids or award of contracts.

The publication of this budget supplements and completes the highway portion of the 1927 legislative budget, which contained only items of highway reconstruction and is in accordance with the policy of budgeting every dollar of public expenditure, without the exemption of any state activity. This policy is based upon the premise that the state is the servant of the people, that the funds which are being spent are public funds, and that the people are entitled to every fact regarding any and all proposed expenditures in advance of their actual disbursement.

Before the inclusion of reconstruction and widening projects in the 1927 legislative budget, state highway expenditures had never been budgeted in any way whatever. Aside from possible political considerations, which, of course, should have nothing to do with a budget of this kind, the reason for this past omission probably was twofold.

First was a natural objection to budgeting, based upon the fact that the "stop-go" method of financing the partial construction or final completion of state highways made it difficult to promise specific projects with any certainty of performance.

A second objection was undoubtedly due to the fact that highway officials sought to avoid the pressure which they knew communities would exert to advance projects of local preferment, if public notice of a proposed highway program was given.

With continuous financing assured through the passage and approval of the one-cent gasoline tax for new highway construction, there is no longer the uncertainty which has existed in past years as to the state's ability to finance an orderly and definite program of road building.

This disposes of the first objection, but it remains yet to be proven whether the second objection to highway budgeting is a valid one.

Will the communities, cities and counties of the state, realizing that "the game is being played with all the cards face up on the table," accept the decision on the part of our highway authorities as to sequence and priority of construction, as representing an informed, fair and unbiased attempt to develop the state's highway system in a proper and businesslike manner?

Will the people be willing to substitute traffic pressure for political pressure as a basis for framing road programs?

I have faith enough in the people of California to believe that they will.

Two facts must be remembered:

The first of these facts is that the entire road system of the state can not be built in any one year, though it will all eventually be built. This budget for the present biennium having been adopted, studies will immediately be commenced to determine the next most pressing needs in preparation for the budget of next biennium. This new budget, moreover, will be prepared during the present year.

The second fact is that the gasoline tax assures the automatic replenishment of state road money, and should eliminate the fear which communities in the past have felt that highway bond funds would be exhausted before their particular roads got their share of the bond issue.

Be that as it may, the people of our state now for the first time have before them a complete highway budget, covering the first biennium of our new highway construction. This budget is the result of many months of intensive study and untold hours of careful weighing of comparative necessities. It represents the informed conclusions of those who are in a position to know best the needs of California's highway system.

Further than this, it represents an important step forward in an endeavor to bring knowledge of the government of California to the people of California concerning one of the state's most important functions. In this endeavor, to what extent may we count on the public's approval and support?

The Story of California's Change To Irrigation from Dry Farming

By J. J. HALEY, JR., Deputy Chief of the Division of Engineering and Irrigation.

CALIFORNIA, second in area, but first among the states of the Union in value of natural resources, satisfied the ever-increasing demand made upon it for its agricultural products, that occurred prior to 1885, almost entirely by dry farming additional areas of land each succeeding year.



J. J. HALEY, JR.

With 23,000,000 acres of arable land in the state, the extension of agriculture to new lands stopped at 12,000,000 acres. Since the demand for the products of the agriculturist continued to increase, and at an accelerated rate, after the expansion of the farming area had ceased, every circumstance and condition existed for the continuance of the extension of agriculture to new areas if it were possible. As a result of the unprofitable farming conditions obtaining on the remaining uncropped 11,000,000 acres, the area under cultivation did not further increase. The experience of the practical agriculturist limited the total area farmed to 12,000,000 acres. Statistics indicate that with the 12,000,000 acres cultivated, all of the state's agricultural area with sufficient natural moisture to mature a profitable crop had been brought into use, together with some additional areas having inadequate natural moisture, but for which accessory supplies were developed economically.

LIMIT REACHED IN 1885

This limit to the area in improved farms was reached in the year 1885. Prior to this, the tilled area had expanded in leaps and bounds from the great impetus given to farming enterprises that followed the worldwide movement to this state after the discovery of gold at the midway point of the last century. This enlargement of the farmed area continued at a rapid rate for a third of a century, then slackening, it ceased about 1885.

IRRIGATION BEGINNINGS

During the period that this area was being

brought under cultivation, 1850-1885, irrigation was practiced to some extent. As early as 1856 water was applied to supplement the natural soil moisture, but no great development in irrigation occurred until the early eighties, when dry farming had reached its limit. In 1885, there were less than 1,000,000 acres under irrigation, while in 1909, when the phenomenal growth in irrigation expansion began, there was approximately 2,600,000 acres under irrigation. This area has steadily increased until now we have nearly 6,000,000 acres of irrigated land in California.

This expansion in the irrigated area reflects the value of the scientific application of water to the soil for growing crops, and the vital importance of water in the economic development of California is forcibly presented in the history of the state's production, and the position it has attained among the wealth producing states of the nation.

AREA FARMED ABOUT SAME

The advance of California to so favorable a comparison in agricultural output with the other states of the Union has not been made by any material increase in the total area in improved farms, but rather by the application of water to areas deficient in natural soil moisture. Although there are 23,000,000 acres of land susceptible of agriculture within the state's borders, the enlargement of the area tilled ceased when but half of the total had been brought under cultivation. As a result of the unprofitable farming conditions obtaining on the remaining millions of acres, the area under cultivation did not further enlarge; the experience of the practical farmer limited the total cultivated to but half the agricultural lands. Some additional areas, having inadequate natural moisture, have since been added to the total area of improved farms by developing accessory water supplies, but the abandonment of other areas previously farmed have compensated in their summation so that the total acreage in improved farms has remained practically unchanged.

CREDIT DUE TO WATER

It may be thus seen that the phenomenal agricultural growth of California is due not to an increase in its cultivable acreage, but rather to irrigation, the scientific application

of water to the fertile agricultural soils already farmed to supplement the natural moisture. The abundant soil moisture obtained through the supplementary supplies has enabled the responsive soils of California to produce manyfold under irrigation. In this way the state has continued to respond to the constantly increased demand for its farm products, and in this way the potent possibilities of California's farm lands are being invoked to a yield greater in value than in any other state of the Union.

IRRIGATION DISTRICTS

This rapid expansion of the irrigated area in California has largely been accomplished through the organization of irrigation districts formed under the state law commonly known as the Wright Act, originally passed in 1887. Many amendments have been made to this act, but the fundamental objections to it were not corrected until 1897, and it was not until 1909 that the organization, development and growth of irrigation districts in California began to increase at a rapid rate.

GUARDED BY STATE

The development of irrigation, and its related problems, which have and are now playing so important a part in the phenomenal growth of California, is the major function of the Division of Engineering and Irrigation of the Department of Public Works. Since 1885, the limit of the dry farming period, the State Engineer and his staff have

been closely connected with the development of irrigation in California, and even more will the future increase the magnitude of his duties and responsibilities in relation to this problem, in the development of which the state has played so important a part. California has spent many thousands of dollars in the investigation and study of irrigation problems and the development of scientific methods of applying water to the land, making it possible for the California agriculturist to develop the fertile soils of the state to their maximum productivity.

In making available to the agriculturist the supplementary waters necessary for the intensive irrigation of his lands, it required the construction of diversion works, dams, reservoirs, canals and other works of such a magnitude that their initial cost prohibited their being undertaken by individuals. In order to construct these works and adequately finance them it has required associated effort, which has been made possible through the California Irrigation District Act passed in 1897, referred to above, further amended in 1913, and the California Bond Certification Act passed in 1913.

SAFEGUARDING BONDS

These acts provide for the approval of organization of districts and general supervision of their construction works by the State Engineer, and the approval and certification of the bonds as legal investments for savings banks by the Cali-

"EVEN MORE THAN IN THE PAST will the future be concerned in the expansion of irrigation to additional acres of land in California," writes J. J. Haley, Jr., Deputy Chief of the Division of Engineering and Irrigation, in this article. He tells here of the development of irrigation in California. Here are some of the high points in the story of the conversion of California from a dry farming state to a commonwealth of high yielding crops, the result of scientific irrigation.

Dry farming predominated in California up to 1885. The total area thus farmed was approximately 12,000,000 acres.

In 1885 when the limit of dry farming was reached there was less than 1,000,000 acres of land under irrigation in California.

By 1909 this had increased to 2,600,000 acres of land under irrigation. At the present time there are over 6,000,000 acres of irrigated land in California.

The total area of cultivated land in California still remains about 12,000,000 acres, the figure at which the dry farming limit was reached in 1885. But there has been an enormous increase in the value of the crops that this acreage produces, which reflects the development of scientific irrigation.

The great development of irrigation in California has been accomplished largely through the organization of irrigation districts. The first act for the organization of these districts was enacted in 1887, but it was not until 1909 that the act had been so amended that irrigation districts increased rapidly in number and area.

Experience has shown that state approval and inspection is necessary for the planning and construction of projects undertaken under the irrigation district law; that state certification is necessary in order to make the bonds of these districts safe and salable. The first of these functions falls to the Division of Engineering of the State Department of Public Works, the second to the California Bond Certification Commission, consisting of the Attorney General, the State Engineer, and the Superintendent of Banks.

There are now 114 irrigation districts in California with a total area of 3,999,150 acres and with a bonded indebtedness of \$140,000,000. This constitutes about two-thirds of the entire area under irrigation in California.

The Water Storage District Act of 1921 and the Water Conservation District Act of 1923 permit the organization of large areas in single enterprise that overlap areas already organized in irrigation and reclamation districts for the purposes indicated in the title of the acts.

ifornia Bond Certification Commission, consisting of the Attorney General, Superintendent of Banks and the State Engineer.



Typical Irrigation District Reservoir filled from pumping plant near Pomona.

Experience gained prior to 1913 demonstrated that for successful culmination of effort the formation of these water-developing projects required by the agricultural expansion of the state has needed state sanction; the bonds issued for salability and safety have needed state certification, and the adequacy of the water supplies to be developed, the safety of the structures erected, the merit of the entire proposals have demanded the state's stamp of approval.

ONE HUNDRED FOURTEEN IRRIGATION DISTRICTS

There are now seven active irrigation districts that were organized prior to 1897, but none originated during the years 1897 to 1909. Beginning in 1909, districts have been organized at an increasingly rapid rate until at present there are 114 irrigation districts in California, comprising a total area of 3,999,150 acres which have voted approximately \$140,000,000 of bonds for the development of their projects. This is about two-thirds of



Furrow irrigation in a cherry orchard in the Sacramento Valley.

the entire area under irrigation in California. The great bulk of this development has occurred since inclusions have been made in the law for state supervision in the organization of the districts and in financing and constructing their projects.

WATER STORAGE AND CONSERVATION

With the near completion of all the projects whose works consist for the most part of storage dams for the individual project, or of diversion dams and distribution canals, necessity has arisen for the organization of large areas in single enterprises that overlap areas already organized in irrigation and reclamation districts. The Water Storage District Act of 1921 and the Water Conservation District Act of 1923 have resulted.

Even more than in the past will the future be concerned in the expansion of irrigation to



Basin irrigation in a prune orchard in the Santa Clara Valley.

additional areas in California and the perfection of the supply for those lands now watered. It is therefore essential that state activities should be guided by thoughts for the orderly and economical development of its water resources, so that all the needs of civilization for water may be supplied while the predominant use for agriculture may expand to the full limit of its wealth-producing powers.

WOMEN PRISONERS OF SAN QUENTIN

(Continued from page 7.)

50 to 54 years, 4; 55 to 59 years, 3; 60 years and over, 2. This gave a total population in the women's prison of 94 prisoners, of an average age of 34 years.

On the same day there were 3667 men in San Quentin of an average age of 32 years.

A gasoline shortage is predicted for the year 2000, but by that time the cars will be so thick they can't move anyhow, so it doesn't matter.—*St. Paul Pioneer-Press*.

Teaching Landslides to be Good

/ / / / / / /

THE "educated landslide" is one of the recent achievements of California.

Up in Humboldt County, District Engineer T. A. Bedford is training landslides in the way they should go instead of allowing them to clutter up the highways and block traffic to the great inconvenience of travel and the greater disgust of Mr. Bedford.



A monitor at work.

Mr. Bedford does not claim that he has one hundred per cent obedience from the landslides yet, but at least he can say that he is schooling them into a greater sense of the proprieties than they have shown in the past.

That credit should be given where credit is due, it should be said that the pioneers who first devised hydraulic mining pointed out the way that has been followed in schooling these northern landslides in better manners.

The story was told at the December conference of district engineers and department heads held in San Francisco.

Pictures were shown of the Big Blue Slide that so completely covered a portion of the state highway in Humboldt County so that in places not even an appearance of the highway was left. The slide area is a third of a mile long, a fourth of a mile wide, and 400 feet high. The material was disintegrating blue shale, marked with many cracks and fissures. It is estimated that there will be 200,000 cubic yards of this material to move in the next few years. It was up to the district engineer to find some way of moving it cheaply.

A 4-inch pipe line was brought from Fish Creek with a 200-foot fall, and half mile distant from the slide. Two deep trenches are sluiced into the mountain side, and so arranged that they converge into a sluiceway.

These trenches catch the slide as it comes down the mountain side and carry the material into the sluiceway, a six-by-five-foot box with a lip on the upper end. These trenches also drain the water out of the slide.

The sluiceway was on a one-to-four slope, but Mr. Bedford recommends a one-to-three slope so that the slide will automatically disperse of itself without sluicing.

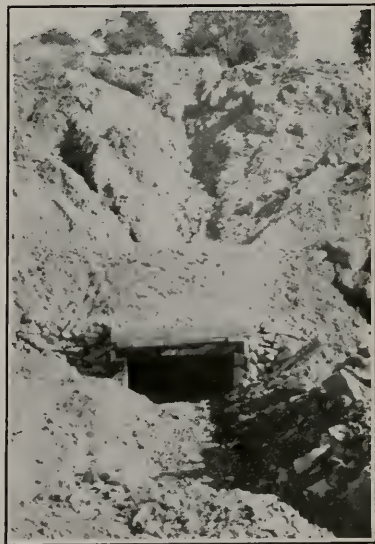
In the operations at the Big Blue slide two men were employed rolling in the bigger rocks into a sump which would hold several yards of material. The rush of water and mud carried these big rocks through.

Three men moved 300 cubic yards of material per day, at a total cost of 10 cents per cubic yard. This was distributed as follows: Wages, 4 cents; transportation, 1 cent; sluiceways, 2 cents; installation, 1 cent; supervision, etc., 1 cent; delays, 1 cent.

Mr. Bedford reports that when the trenches are dug and the slides "trained" to follow them, very little care is necessary. Last winter 25,000 cubic yards of material went through one of these sluiceways with very little attention.

The hydraulic method of slide removal is also being used by Mr. Bedford on the sand bluffs near Trinidad in Humboldt County. Thus far about 35,000 cubic yards of material has been moved at this point at an average cost of eight

cents a cubic yard. It is estimated that there are about 150,000 cubic yards of material there yet to move. The water was brought from a creek about 2000 feet away by a single stage centrifugal pump driven



How material is collected and disposed.

(Continued on page 20.)

CALIFORNIA HIGHWAYS AND PUBLIC WORKS.

Official journal of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

BERT B. MEEK.....Director
GEORGE C. MANSFIELD.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 5 JANUARY, 1928 No. 1

PRINCIPLES AND PROBLEMS IN HIGHWAY BUDGETING

On other pages of CALIFORNIA HIGHWAYS AND PUBLIC WORKS will be found a detailed statement of the state highway construction program and budget for the biennium of July 1, 1927, to June 30, 1929.

The budget represents many hours of thought and days spent in the collection of data upon which the highway program could be intelligently based. It may be of interest to tell something of the principles upon which California's first complete highway program has been based and the problems that confront the budget makers.

The first requirement naturally has to do with the income. Money must be available before it can be spent. How much money will be raised during the biennium by the various laws through which highway finances are provided is the first question that must be answered.

The budget makers, in their estimate of expenditures, must be governed by their estimate of income. And this latter estimate has to be conservative enough to assure income to meet all obligations for expenditure, and yet must guard against the accumulation of excessive, idle and unused balances.

The division of estimated income in accordance with the requirements of the Breed law, is the next step in the process of budget making. This requires a division of income upon the basis of 75 per cent to Primary roads and 25 per cent to Secondary roads. It then requires the distribution of these funds on the basis of 54.7 per cent of the Primary road money to northern counties and 45.3 per cent of such money to southern counties. The line between these two groups of counties is the northerly and westerly boundaries of San Luis Obispo, Tulare, Inyo and Mono counties. The Secondary road money is divided between the two groups of counties on a 50-50 basis.

Within these groups of counties, the distribution of the funds lies within the discretion

of the California Highway Commission. Recommendations are made to the Commission by the Director of the Department of Public Works, who in turn in preparing the budget recommendations is assisted and advised by the engineering department of the State Highway Commission.

Certain very definite principles prevail in the preparation of the budget and its adoption by the Highway Commission.

First, the character of state highway work requires its distribution over large areas of the state, to meet the road requirements of the state. This is necessary both to prevent undue disturbance with local labor and supply conditions in any part of the state, and to enable a balanced program of urban and rural highway construction to go forward in an orderly and economical manner.

Second, the allocation of funds to particular roads requires a most careful study of varying conditions that may prevail on that road to the end that the section or sections of the road chosen for first improvement will result in the greatest possible betterment to the whole road, and the greatest possible service to traffic on that highway. In other words the budget is based upon a plan for the progressive improvement of each road with priority to sections that most require attention.

The final budget represents a most comprehensive consideration of the whole state highway system, coupled with a most intensive study of each road within that system.

Governor Young, in an article concerning the highway budget that appears on another page of this journal, put the matter tersely when he wrote in the concluding paragraphs this statement:

The people of our state now for the first time have before them a complete highway budget, covering the first biennium of our new highway construction. This budget is the result of many months of intensive study and untold hours of careful weighing of comparative necessities. It represents the informed conclusions of those who are in a position to know best the needs of California's highway system.

Further than this, it represents an important step forward in an endeavor to bring knowledge of the government of California to the people of California concerning one of the state's most important functions.

In this endeavor, to what extent may we count on the public's approval and support?

CONTRACTORS BIDDING BELOW ESTIMATED COST

Interesting facts relative to contracting conditions are revealed by a study of the bids received by the California Highway Commission on jobs during the months of October, November and December of the year 1927.

A total of 32 jobs were offered for contract during the period, upon which 211 bids were received, or an average of 6.6 bids to the job.

The total estimate of the engineers on this work was \$1,664,819.31. The low bids received by the Commission totaled \$1,439,616.06 or \$225,203.24 below the engineer's estimates. Expressed otherwise the work was contracted for at an average of 13.5 per cent below its estimated cost.

ROADS MAKE SNOW SPORTS POSSIBLE IN CALIFORNIA

The cover design in this issue, contributed to CALIFORNIA HIGHWAYS AND PUBLIC WORKS through the courtesy of the Stockton Chamber of Commerce, shows a scene on one of the state's popular highways for autoists both in summer and winter. It reaches the higher recreational regions of the Sierras, being one of the main through mountain roads to Nevada and intermediate points such as Tahoe, Tioga Pass, Calaveras Big Trees, etc.

This particular section of the road shown in the photo was relocated, graded and surfaced by the State Highway Commission in 1926 making it an all-year road as far as the Big Trees of Calaveras. The new road eliminates many bad turns and grades and is so located that danger has been eliminated for winter travel making it possible to hold winter snow sports in the region traversed by the road.

In January of each year the Boosters Club of Angels Camp conduct a snow frolic at the Big Trees, the event taking place on January 15th, this year. Thousands of autoists made the trip on that day for the great diversity of sport afforded including tobogganing, skiing, bob sledding and snowballing.

RIGHT OF WAY WIDTHS

(Continued from page 5.)

employed. Our present policy permitting the use of signs, providing they are affixed or suspended from the owner's property, is rapidly establishing a precedent, the ultimate discontinuance of which will be productive of considerable bitterness.

I believe the time is opportune for the revoking of this privilege and the removal of those now in place, as their object is admittedly to attract the attention of traffic, thereby adding to its hazards.

The equity and approval of small business usurping the highway frontage to its peculiar use is a problem which might be settled by

setback lines established either by legislative action or conditional right of way deeds. The width of such an establishment should, to justify its purpose, provide service for a traffic more or less local in character, independent of the main through traffic. To accomplish this without a distinct separation of the traffic lanes is hardly satisfactory, due both to the intermittent flow of traffic and the tendency of local traffic to disrupt that of the main line. A fifty-foot establishment on either or both sides of the main highway would provide for two lanes of traffic with space reserved on either side adjacent to the curbs for parking. Light posts and sidewalks should be placed between the curb and property line. Trees have no place within this space unless the section is more residential than business. Such an establishment would permit the inclusion of the eighty-foot design, the present space reserved to sidewalks, trees and poles, providing a separation between the two lanes, with openings at frequent intervals to provide a ready contact with the main highway. The resulting main section would then assume the aspect of a superhighway devoted entirely to high speed traffic with parking limited to the side establishments.

We have within the highway system many recreational roads whose charm and appeal are largely dependent on the natural tree growth. Each year fire loss of this asset reminds us of the necessity for its protection. Rights of way through these areas should be increased to provide a ten-foot fire lane at least fifty feet on either side of center. This lane might be hidden from the roadway by proper tree screens and might usefully serve as bridle or foot paths. The clearing and burning of brush and fallen logs within this area would not only please the eye but remove a dangerous fire hazard.

To summarize my opinion on this subject:

The proper utilization of the highway right of way to provide for the ultimate development dictated by traffic, and the accommodation of encroachments more or less associated with this development, such as trees, pole lines and service utilities, should be definitely determined.

The necessity and importance of this step will be understood when it is realized that present studies indicate traffic will more than double within the next fifteen years and that approximately 90 per cent of our right of way does not exceed 60 feet in width.

The design adopted should not only satisfy the major requirements, but the locations of

(Continued on page 17.)

Legislative Water Committee

Studies Areas Where State's Surplus Water Would be Used

FOLLOWING its first tour through the counties of northern California where surplus waters are reported to exist, the Joint Legislative Committee on the Coordination of the Water Resources of California visited areas in December where the report on the coordination of such water supplies declares a use for surplus water exists.

The trip of investigation, with its accompanying hearings, took the committee into the industrial areas along the Carquinez Straits and Suisun Bay; through the Delta region, and then down the east side of the San Joaquin Valley as far as Bakersfield.

The interest in the issue under consideration by the committee was shown by attendance at meetings and the open and frank discussion of the problems involved.

The problems of usage of these surplus waters as they developed during the progress of the December trip of the committee might be summarized as follows:

1. Industrial uses. This covered the question of encroaching salt water upon the extensive industries of the Carquinez Straits and Suisun Bay region; the question of the practicability of the solution of the problem by the erection of a salt water barrier; the investigation of the three sites proposed for such a barrier. These sites with estimated maximum and minimum costs depending upon the type of structure, methods of construction, whether or not a bridge is built over the barrier and other construction factors, are as follows: San Pablo Point, from \$60,000,000 to \$82,100,000; Dillon Point, from \$38,900,000 to \$97,100,000; Army Point, from \$46,300,000 to \$58,500,000.

2. Delta lands use. This covered an investigation of the salinity of the delta area of the Sacramento and San Joaquin rivers; a discussion of the effect of a salt water barrier upon levees in the delta region, and the consideration of the question of whether such a barrier would increase seepage to the extent of damaging delta lands. It appeared to be generally agreed that 3500 second-feet of water released into

the delta from the Sacramento and San Joaquin rivers would solve the salt water problem as far as delta lands were concerned. The question was also discussed as to whether water impounded in mountain dams and released during the summer for irrigation served to increase the fresh water flow into the delta region, or whether impounding of such water was detrimental to these lands.

3. Transportation use. This discussion centered around the effect upon river transportation of a salt water barrier and the probable attitude of the U. S. War Department relative to its erection. The matter also was discussed as to whether the constant opening of locks for vessels would not admit a dangerous amount of salt water behind the barrier. Figures relative to the tonnage carried on the Sacramento and San Joaquin rivers, a tonnage larger than that of the Mississippi River, were submitted to the committee.

4. Irrigation use. This phase of the question became increasingly important as the committee progressed down the San Joaquin Valley. The discussion covered not only the practicability of the plan of bringing Sacramento River waters into the lower San Joaquin Valley, the willingness of present users with established water rights to "trade" their water for water "imported" into the valley; the adequacy of present water supplies in the irrigation areas of the east side San Joaquin Valley; the extent to which the water table is being lowered in the southern San Joaquin Valley, and possibilities, if any, of replenishment from local sources.

Edward Hyatt, Jr., State Engineer, explained the coordinated water plan. He stated the report was tentative in its character, covering engineering phases of the problem. The purpose of the hearings was explained by members of the committee.

Mr. Hyatt outlined the report as far as the San Joaquin Valley was concerned as providing for a series of fourteen low lifts from the delta into which surplus waters of the Sacramento River would be brought into a series of reservoirs created by damming the San Joa-

(Continued on page 21.)



Legislative Committee on Coordination of the Water Resources of California. Standing—left to right: Assemblyman Frank W. Mixer, Exeter; Assemblyman Van Bernard, Butte City; Senator H. C. Nelson, Eureka; Assemblyman E. G. Adams, Livingston; Senator Ralph E. Swing, San Bernardino; Assemblyman B. S. Crittenden, Tracy, chairman. Kneeling—Senator Edward A. Mueller, El Cajon, Senator William R. Sharkey, Martinez.

State Road Men Perfect New Machines

A PHASE of California highway work to which but little attention has been called is the improvement of road machinery and equipment, developing out of ability of men connected with the Division of



View showing new grading attachment.

Highways and the problems that confront them and require a practical solution.

In the accompanying article a description is given of two devices recently perfected by members of the Division of Highways. These improvements have been thoroughly tested and undoubtedly will be adopted by road builders generally.

GRADER IMPROVEMENT

In the past, considerable time has been lost in the process of shoulder grading due to the necessity of removing the material graded onto the pavement surface.

O. F. Georges, maintenance superintendent of District III, has devised an auxiliary mold board and leveling blade which removes this material from the pavement surface and levels it along the shoulder during the process of grading, thus affecting a saving of one trip with the equipment.

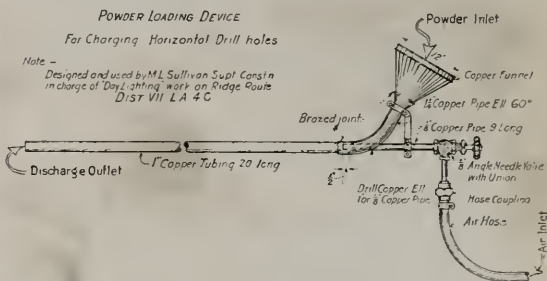
The attachment weighs approximately fifty

pounds and can be readily installed or removed. Headquarters' shop is prepared to make up this attachment for any type grader at a cost of approximately \$40.

Herein is a view of the "Georges Single Trip" attachment showing it in operation.

POWDER LOADING DEVICE

The accompanying sketch shows the design and operation of a powder loading device perfected by M. L. Sullivan, superintendent of construction, in charge of removal of blind curves on the Ridge Route.



This device was designed to overcome the difficulty of loading horizontal drill holes with black powder, and has proven very successful on this job. Twenty-five pounds of black powder have been placed in approximately one-half minute.

The method of operation is to pour the powder from the can into the funnel shown on sketch as "Powder Inlet." Then, on releasing the compressed air, furnished by the compressor on the job, through the one-eighth-inch bronze needle valve, the powder is carried through the 1-inch copper tubing to the bottom of the hole. As the hole is filled with powder the tube is gradually withdrawn.

Various devices have been tried out for loading powder by air, but this device appears to be the most perfect one yet developed.

RIGHT OF WAY WIDTHS

(Continued from page 15.)

the various factors in it should be along such lines and grades as will permit their inclusion when additional rights of way become necessary.

The determination of where additional rights of way are necessary should be made

at once, as it is not unreasonable for an abutting property owner to require our plan of design in order that he may build with the assurance that his improvements are permanent.

Ninety-five per cent of the automobiles in the world have either been manufactured in the United States or assembled in foreign branches of American plants.

Important Line Changes are Perfected

ON JUNE 29, 1927, a contract was awarded the A. Haidlen Company of Sacramento for the reconstruction, widening and straightening of 6.78 miles of highway in Shasta County, on Route 3, a primary road, between La Moine and Shotgun Creek. This unit in on the famous Sacramento Canyon route of the Pacific Highway, and is a continuation of the reconstruction which has been in progress during the past four years. The following account of the work is furnished by E. J. Bassett, resident engineer:

Location standards used on previous reconstruction on this route have been maintained on this unit; in fact, owing to peculiarities of the topography, both curvature and gradient are noticeably lighter than average. The existing highway, constructed in 1914-15, was one of the first mountain sections to be constructed in District II, and is characterized by sharp curves and heavy grades and many of them, which in comparison with the new work, might well be described as tortuous.

The work under contract is 6.7 miles in length, as against 7.47 miles of corresponding limits of the original highway. The greatest single saving in distance is accomplished at Pollard's Gulch, where the last of the four large bridges on this route is now under construction. The relocation required for the bridge crossing eliminates 1537 feet of crooked, narrow road, fraught with blind curves, along the slopes of a deep, precipitous canyon, where accidents have been both frequent and disastrous, and gives to the traveler, in its stead, a broad, sweeping boulevard with flat country on either side the bridge, and with the sight distance extended to hundreds of feet. At the extreme northerly end of the work the last few hundred feet lap over on another major change which will accomplish a substantial saving in distance on future work. The remainder of the decrease in distance is obtained in minor departures from the old line, and in longer radius curves.

The major contract items are: 207,800 cubic yards roadway excavation; 1070 cubic yards Class "A" concrete; 4822 lineal feet small culverts; 15,710 cubic yards crushed rock surfacing.

The job was well equipped. A brief outline of the major equipment follows: 4 Northwest power shovels, 1 1/2 cubic yard; 15 heavy duty trucks of various manufacture; 2 tractor and grader outfits; 1 one-man patrol; 4 1/2 to 2-bag concrete mixers; 1 Ames No. 4 gyratory crusher; 1 Symons disc crusher; 1 P. & H. power shovel, 5 cubic yard (quarry).

The contractor's forces consisted of nine separate sub-contracting units.

Progress during the early weeks of the work was slow. Delays in getting the culvert work under way, and out from underfoot, made it impracticable to operate the full shovel force until September 14th. Some work was accomplished during this period of culvert delay, but the 29,000 cubic yards removed is small for the best working months of the season. The next two months produced 102,000 cubic yards of excavation, and also saw the culvert structures well out of the way, but early storms cut into operation so heavily that the third two-month period produced an output of only 28,000 cubic yards. There still remains 23 per cent of the yardage to be moved.

Surfacing of the roadbed is far behind schedule, but has progressed as fast as subgrade could be prepared. The contractor has, however, resorted to stockpiling base rock, and has built up a 2000 cubic yard reserve which can be put on the road without the usual delay in crushing.

This unit of work covers one of the most difficult sections of the canyon, as regards soil and water conditions. Clays, red, yellow and blue, and tale, all of which are difficult to work during wet weather, constitute the greater portion of the excavation, while lava boulder dykes and infrequent shale deposits occur in lesser quantity.

Throughout one continuous mile the work lies across an ancient slide composed of blue clay, tale and serpentine formations, where the whole canyon

slope collapsed and slid to lower levels. Cut slopes through this formation were planned 1:1, yet, at present, with only 25 inches of rainfall, and no protracted or heavy storms or snow, several slides have formed and give promise of future difficulties.

Specifications prohibited opening up of the clay sections during the wet season except upon written authority. Due to the early delays, it was not possible to start excavation in the heavier clays until September 15th, and with the arrival of the wet season, October 26th, a large part of the work in this material remained to be done. Much has been accomplished by ballasting the clay roadbed with shaly material. By shifting planned hauls and by borrowing where shale deposits occurred, a layer of ballast, varying in thickness from six to eighteen inches, dependent upon the condition of the subsoil, has been spread over the clay, enabling the contractor to construct acceptable subgrade for the placing of the surfacing, as well as to operate his grading equipment where it would otherwise have been impossible. The contractor has on several occasions profited by our example, and has placed ballast at his own expense, and provided runways over soft roadbed for his trucks, and for maintaining traffic over temporary by-passes.

Throughout this unit heavy gutter ditches are being constructed, larger than are usually designed. During the winter and spring months seepage and

**Table Shows Extent of
Location Improvement
In Sacramento Canyon**

	Original	Recon-
	struction	struction
Number of curves--	143	42
Degrees of curvature -----	5,794°	1,672°
Length of curves----	12,368	22,027
Number of tangents	171	19
Length of tangents----	27,089	13,761
Radii -----	Min.	Min.
	50	300
	Max.	Max.
	300	4,400
Gradient -----	7%	6%

springs exist throughout all of the clay sections, and in order to protect the subgrade, ditches 21/5 feet in depth, with 2-foot bottoms, have been commonly used. In a few cases the depth has been increased to 3 feet, particularly on that portion crossing the ancient slide.

REDWOOD HIGHWAY CHANGE.

Of interest to the public is the recent opening to traffic of a portion of the Redwood Highway in Humboldt County, between Fernbridge and Loleta, a distance of approximately two miles. W. W. Compton, resident engineer, has furnished CALIFORNIA HIGHWAYS AND PUBLIC WORKS with an account of this important change.

For several years the travel has been on the county road. This road, while wide, was not on good alignment and a dangerous railroad grade crossing existed at Singley, about one-quarter of a mile north of Fernbridge. The road practically paralleled the right of way of the Northwestern Pacific Railroad on the east to the grade crossing at Singley and then along the west side of the railroad, connecting with the paved state highway near Loleta. At Loleta the highway crosses the railroad right of way through an undergrade crossing.

CHOICE OF TWO ROUTES

Two routes were considered for the new construction: One, to cross the railroad by an overhead crossing at Fernbridge and then parallel the railroad on the west; the other, to stay on the east side of the railroad. On the west, the flood water of the Eel River was the problem to contend with and on the east, bluffs, susceptible to sliding. The bluffs were chosen as the lesser of the two evils and the railroad crossings eliminated.

RAILROAD ALIGNMENT CHANGED

In order to keep the new alignment to present standards, and to keep from "hit-

ting" the bluffs too hard, it would be necessary to encroach upon the railroad property in many places. An agreement was made with the railroad company whereby the state

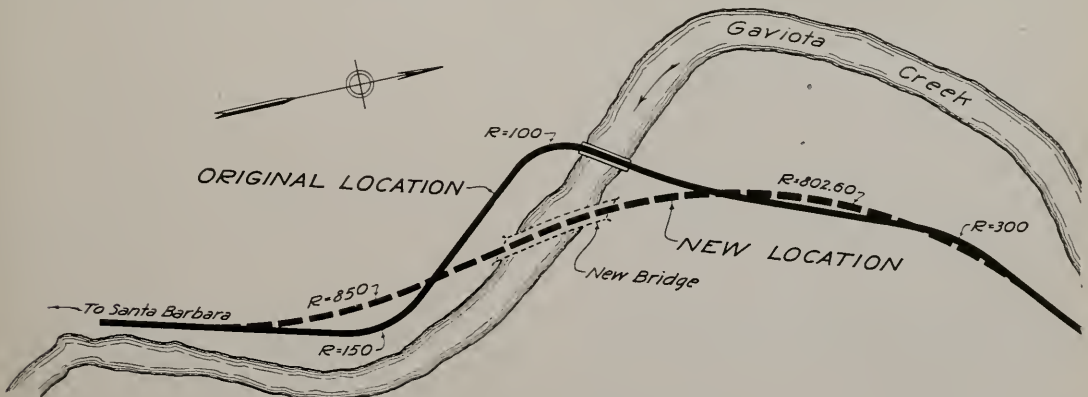


View showing line change on Redwood highway in Humboldt County.

was allowed to change the railroad alignment, move their stock corrals and other facilities at Singley, and the highway fill slopes were allowed to "catch" on the final railroad right of way, thus saving many cubic yards of excavation. At the same time an improvement was accomplished in the railroad alignment; thus the work included not only the grading of a new highway but the grading of a new railroad roadbed and a new site for the stock corrals.

The contract was awarded to the Kaiser Paving Company of Oakland in December, 1926.

The new Le Tourneau grading machines were used on this contract. These machines were used on highway work for the first time



Sketch of Gaviota Canyon change.

on San Francisco's "bottle neck" near Colma, and have been described in a previous issue of this publication.

IMPROVE EQUIPMENT

Several improved changes were made in these machines while on this contract. The machines were electrically operated and towed by a "50" caterpillar. Formerly the generator was located on the caterpillar with cables leading to the motors on the machine. This arrangement took too much power from the caterpillar while loading and in hard ground it was necessary to repeatedly start and stop to keep from stalling the caterpillar. To overcome this, a power unit, gas engine with generator, was installed on the grading machine and the caterpillar's power was only used for towing. After this installation the machines could load without stopping. Machines operated by hydraulic pressure were also tried on this work. The operator's control was compressed air valves near the caterpillar seat. This type of operation promises to be successful.

The railroad grade was even but the highway grade above was undulating. Much of the material from highway cuts was used in railroad fills. Long hauls were necessary in some cases.

CARE OF TRAFFIC

One of the problems was taking care of both motor and train traffic. The new highway occupied parts of the old railroad track and the new track occupied parts of the old road.

As is the case at times in this district, the contractor was racing to finish before serious storms started and was successful. The contract was completed in December.

GAVIOTA CANYON CHANGE

Early in December a line change was completed in Gaviota Canyon, including the construction of a new bridge and a quarter of a mile of new roadbed. This constitutes a distinct improvement in the alignment through the canyon. The bridge was constructed by Oberg Brothers under the supervision of the Bridge Department at a cost of approximately \$21,000, while the line change was graded and surfaced by Hodson and Carter under a district contract at a cost of about \$10,000.

"Yes," said the specialist, as he stood at the bedside of the sick purchasing agent, "I can cure you."

"What will it cost?" asked the sick man faintly.

"Five hundred dollars."

"You'll have to shave your price a little," replied the Purchasing Agent, "I had a better bid from the undertaker."

Visalia Contractor Heads Association of Northern Builders

J. S. Caldwell of Visalia, was chosen president of the Associated General Contractors of America, Northern California Chapter for 1928, at the final business session of the two-day annual convention held during December in San Francisco.



J. S. CALDWELL.

Caldwell, who is head of the Valley Paving and Construction Company, succeeds James B. Fraser of Eureka.

Paul B. Fay, head of the Fay Improvement Company, San Francisco, was elected

vice president. The following directors were chosen: J. L. Fairbanks, San Francisco; J. F. Knapp, Stockton; State Senator E. S. Berney, Fallon, Nevada; Adolph Teichert, Jr., Sacramento, and James B. Fraser, Eureka.

Earl G. Lloyd of San Francisco was reelected executive secretary and manager, and F. O. Booe, San Francisco, assistant.

More than 200 contractors were in attendance at the convention. It was the ninth annual meeting.

TEACHING LANDSLIDES TO BE GOOD

(Continued from page 13.)

by a Cadillac motor. It was pumped through 1000 feet of 5- and 4-inch pipe and raised 70 feet. It was then picked up by a 5-stage centrifugal pump and raised 90 feet through 1000 feet of 4-inch pipe. About 200 gallons of water per minute was delivered. With two pump runners and two nozzle men from 1000 to 1200 yards was moved per day at an average cost of eight cents a yard. This material was easily carried in suspension through a flume laid on a 10 per cent grade to the ocean below.

Where water is available it is planned to do considerable road widening through the sand bluffs by this method.

More powerful pumping plants delivering a larger volume of water under higher pressure will move the dirt still cheaper.

New Bridge Soon to Span San Joaquin

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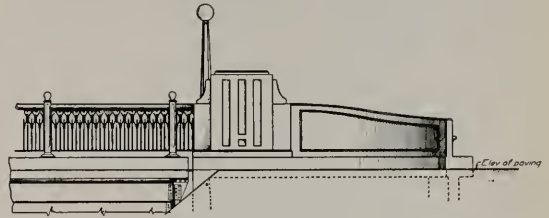
Plans are now complete and specifications are being prepared to advertise at an early date for the construction of a new bridge across San Joaquin River at Herndon near Fresno. This structure will consist of four 162-foot deck steel truss spans, two 83-foot deck girder spans, and one 66-foot deck girder span supported by concrete piers which in turn rest on a pile foundation. The deck and curbs and end post are to be constructed of reinforced concrete.

This structure will provide a 30-foot clear width of roadway, the truss being designed so that an additional 10-foot width of roadway may be added at such time as traffic conditions demand it.

This bridge is to be constructed on the south side of the railroad bridge thus eliminating the present grade crossing over the

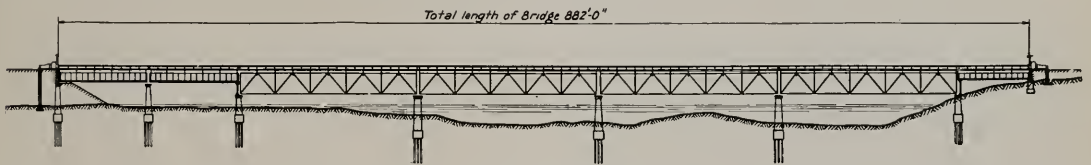
railroad tracks at each side of the river, and will replace the present narrow bridge across the river.

Special features of this structure are ornamental railings, the lighting arrange-



View showing detail of rail of new Herndon Bridge.

ments, and pedestrians' retreat at each end. The railing is to be constructed of iron and cast steel and will be used again when the bridge is widened.



Profile of new Herndon Bridge.

LEGISLATIVE WATER COMMITTEE

(Continued from page 16.)

quin River. The water would be taken back as far as Mendota by this method. From there it was planned to trade the Sacramento water for the San Joaquin water, diverting the San Joaquin water back into the area now irrigated by the Kings River. The Kings River in its turn would be diverted back to serve Tulare and northern Kern County, thus relieving the areas of deficient water supply there.

At Merced, Fresno and Hanford discussion centered chiefly on absolute assurance that if water was so traded that the present users in the areas mentioned would be certain of receiving the "traded" water without further expense to them.

At Porterville, Tulare, Delano and Bakersfield the discussion emphasized what was declared to be the necessity of importing outside water to redeem underground supplies of water.

At the Porterville meeting J. P. Lippin-

cott, consulting engineer who assisted the report on the coordination of the state's waters, declared that the construction of the Kennett reservoir would yield more water than would the Boulder Canyon dam. He further declared that the engineering difficulties involved in the coordinated plan were less than those in the Colorado River, substantiating this by statements that the Colorado project involved a lift of 1600 feet against a lift of 180 feet from the delta to Mendota, and that the Colorado project required some distance of tunnels against a series of low dams on the San Joaquin.

The legislative committee is planning hearings in February at which economic phases of the plan will be discussed.

Creation of a commission to study proposals for the establishment of a system of express highways to be built by private capital, and which would become public property after they were paid for out of toll charges, is proposed in a resolution introduced into Congress by representative Allen J. Furlow, of Rochester, Minn.

State Highway News and Comment

About three miles south of San Luis Obispo there is a wooden trestle on the main coast highway, about 500 feet in length. This



When oil and trestle mix.

trestle was built by San Luis Obispo County many years ago, and on the side of it there was supported an 8-inch oil pipe line leading from the large tank farm near San Luis Obispo to Port San Luis. On the morning of Friday, December 2d, the oil company owning this pipe line, attempted to weld a leaking collar and during the process the collar split, releasing a jet of oil which proved to be refining naphtha, which was being pumped through the line at the time. This immediately ignited, started the trestle burning and formed a burning pool of oil beneath the trestle.

The oil company immediately ordered out a large force of men to fight the fire and summoned fire fighting apparatus from San Luis Obispo, but approximately 280 feet of the trestle were burned before the fire could be put out.

The oil company immediately put on a large crew of men replacing the trestle and within three and one-half days they had traffic using it once again.

Fortunately a county road was available at this point as a convenient detour and the inconvenience to public traffic on account of this emergency was comparatively slight.

Truck Driver Fined For Destruction of State Highway Marker

As a result of evidence furnished by warehouse foreman, P. H. Ashley, the driver of a heavily laden Mack truck and trailer was found guilty by Judge Marks, of Needles, for

OLD INDIAN BURYING GROUND IS ENCOUNTERED ON PISMO CONTRACT

One of the steam shovels of Contractor Knapp, working on a line change about one-half mile north of Pismo Beach, recently encountered an old Indian graveyard. Four skeletons were exhumed, and the fact that mortars and pestles were found buried with the skeletons, denotes that they were undoubtedly the remains of Indians. Apparently the skeletons are very old for it was found that the bones crumbled on exposure to the air.

pulling up, defacing and completely mutilating one of the new state highway markers on the Old Trails Highway near Fenner.

The truck and trailer were found outside the traveled area of the highway. The driver was absent, evidently in search of help. The marker had been ground to splinters under the wheels in an effort to gain traction in the sand. A complaint was filed by maintenance foreman, E. C. Foust. The defendant plead guilty and was fined \$25.

The picture shows a traffic stripe in Kern County. The dash line is being used in preference to the solid line as it saves paint and also makes a distinct line.



Subway Is Completed

The motoring public will be pleased to learn that the Ben Ali subway under the Southern Pacific tracks in Sacramento County is now complete. This structure, together with the greatly improved alignment and widened roadway, eliminates a very dangerous railroad grade crossing and one which in the past has been the scene of a number of serious accidents.

Governor Young Makes Budget Pronouncement

A pronouncement by Governor C. C. Young as to the budget policy to be followed during the second biennium of his administration was the outstanding feature of the meeting of the Governor's Council held on December 21, 1927. Governor Young opened the meeting of the Council with the statement to the directors of the various departments that budget estimates for the next biennium must be kept within the present budget figures, except for irreducible fixed charges in schools, payments on bond issues and the like, and in those institutions where increasing population of the state brings an increasing number of persons and inmates for them to serve.

Riverside Resident Applies Golden Rule to State Dealings

Here is one resident of California who believes in applying the Golden Rule as applicable to the state as well as to individuals.

The following letter tells its own story and is said to be unique in state highway correspondence:

March Field, Riverside, Calif.,
December 25, 1927.

State Highway Commissioner,
Sacramento, California.

Dear Sir:

Last night while driving between Riverside and March Field, something happened to the steering mechanism in my car which caused me to run out of the road and collide with a fence on what I believe they call Box Spring Grade.

The damage to the fence must have been considerable and this is to advise you that I am willing to pay for the repair of that fence. I have no idea what is the custom in this state, but I am certain that this accident should have been avoided by me and for that reason I am quite willing to pay for all the damage.

Yours very truly,

CLARENCE HAYMES.

An investigation of the damage is being made by the state highway forces.

Every owner of a motor vehicle in Connecticut is required to maintain a windshield cleaner on his machine. Recently the owner of a truck was haled into court on a charge of having violated the windshield wiper law. Evidence was submitted which conclusively proved that he had no windshield wiper. The defendant himself admitted that he had no windshield wiper, and his defense was that he had no windshield upon which to attach and use a windshield wiper. It failed to secure his acquittal and a fine was imposed.

Instructive Highway Conference Is Held

A most instructive conference of the district engineers and heads of the departments of the California Division of Highways was held in San Francisco on December 13th. The following program indicates the subjects discussed in the conference:

Talk by District Engineer Bedford, followed by general discussion.

Subject: "Slide removal by hydraulic methods."

Talk by District Engineer Comly, followed by general discussion.

Subject: "Economic size of convict camps, etc."

Talk by District Engineer Skeggs, followed by general discussion led by District Engineer Haselwood and Principal Accountant Schleip.

Subject: "Financial control in the district offices of expenditure of allotments on contract and day labor work orders."

Talk by District Engineer Cortelyou, followed by general discussion.

Subject: "State vs. local responsibility in connection with securing rights of way, also general problems concerning rights of way matters."

Talk by Equipment Engineer Stalnaker, followed by general discussion.

Subject: "Equipment administration, etc."

Talk by Surveys and Plans Engineer Grumm, followed by general discussion led by Maintenance Engineer Dennis.

Subject: "Proper widths for rights of way and space to be allotted to each element of the improved cross-section, such as pavement, grade, curb and sidewalk, trees, etc."

Talk by Construction Engineer Pope, followed by general discussion.

Subject: "Standard vs. patented pavements."

Supper meeting at Whitcomb Hotel.

Talk by Materials and Research Engineer McKesson on his recent trip.

California Highways Lauded by Brisbane

Arthur Brisbane in his syndicated column "Today" writes:

No man knows what a state can do in road building until he has driven over a few thousand miles of California roads. New Jersey and other states have made a beginning—California shows the finished product.

Bring your car here, travel ten thousand miles and leave without a bump.

Parking space has been discovered at last. Afghanistan has one motor car for every 1,200,000 inhabitants.—*Wichita Eagle*.

Removing Snow From Mountain Roads

A NEW ROTARY snow plow has been purchased for use on the San Bernardino to Big Bear Highway. It was given a trial after a recent snow storm and there is every indication that it will be a success.

Heretofore, the equipment used for clearing snow from this route has consisted of trucks or tractors equipped with grader blades. This method is effective so long as the snow does not exceed a depth of 12 to 18 inches. Snow over this depth impairs the movement of the trucks or tractors and the accumulation on the edges of the roadway reduces the effectiveness of the clearing. The rotary plow by the propellor action of rapidly rotating blades throws the snow clear of the roadway, thereby gaining relief from this clogging effect. It is possible for this machine to plow through deep drifts, thereby opening the road when it would be necessary to wait until spring for clearance by the blade machines.

There can be no doubt that the winter season's use of this highway will be increased by the use of this new equipment.

SNOW REMOVAL METHODS

The following instructions to drivers has been worked up by Foreman E. M. Shelton, stationed at Mount Shasta City, and in charge of snow removal between Dunsmuir and the Shasta River. These, Mr. Shelton has found necessary in schooling new employees on this work. They are based on his five years' experience in keeping this road clear of snow, and apply particularly to snow removal by means of a Nash truck with snow plow attachment, as most of the snowfall has been removed by this means. It is only the more infrequent, heavy storms that require the use of the larger plows.

This draft, based on Mr. Shelton's experience, may be of interest to other foremen engaged on the same work:

Operators should familiarize themselves with the

road, so they will recognize the wide and narrow places when covered with snow.

Truck should be allowed to warm up at least ten minutes before leaving shed. Be sure you have two red flags, one red lantern, and a tow cable or chain.

Adjust plow one-half inch above pavement. Always keep a slight strain on chain used to raise and lower plow. This is very essential for many reasons—it will not remove the asphalt, and helps the efficiency of the truck.

When snow is more than four inches deep, give blade all the angle possible. This will fold the snow instead of pushing it ahead, and thereby clear its way more quickly, and again help the truck. In depths under four inches, blade may be almost square, as truck will handle it with ease, and you will have a greater width cleared.

Make all the speed possible with due regard to yourself, the truck and the traveling public. This is a great factor to be remembered, as it puts the snow from two to eight feet in the clear, and of course, you can get over more road. However, due precaution should be taken when passing or meeting cars, approaching stalled cars

and bad curves, and other obstructions or dangerous points.

When pavement is not packed with frozen snow, always slow down for dangerous places in pavement and railroad crossings.

If snow is falling fast, do not stop to help anyone out, unless there are women and children or someone hurt, as you could do this all day and not get anywhere with your snow removal.

If, for any reason, you have to stop on bad curves or grades, send out flagmen at once. Do not wave flag violently, as the driver may become startled and get nervous and apply his brakes suddenly, which, on an icy road, might cause a serious accident.

When removing snow in cuts, with the bank near the pavement, keep center line of pavement about two feet to the left of end of plow, as you have no place to put the snow on that side, and ample room on the other. This will also help going up steep grades, as it will not put so much of a load on the truck the second trip, but will have more of a load coming down hill, which it will then handle easily. Likewise, on superelevations, keep to left of center line, when super is at your left. In other words, keep two feet past center line on super side.

Avoid getting truck off of pavement as much as possible, as shoulders are usually soft, and there is a very small clearance on the hook up beneath front axle.

Always put the rear end of truck off of the road when turning.



A snow plow at work.

U. S. Road Chief Tells Asphalt Men Road Needs of Nation

THOMAS H. MacDonald, chief of the United States Bureau of Public Roads, was the chief speaker at the Annual Asphalt Paving Conference held in December in Atlanta, Georgia.

Mr. MacDonald's address dealt with highways in the making, fundamental policies of the Bureau of Public Roads, damage to highways in flooded areas and various other pertinent matters.

ROADS WITHSTAND FLOODS

The speaker declared that observation and experience as a result of the floods along the Mississippi and in New England has strengthened confidence in the ability of modern highway construction to withstand unprecedented flood conditions. The losses on federal aid roads in Vermont, for instance, he said, was only 5 per cent in proportion to the federal funds invested. The federal aid roads in the flooded districts of the Mississippi Valley withstood the ravaging waters equally as well.

CAN NOT AFFORD BAD ROADS

"The program of this nation in building highways," said Mr. MacDonald, "has had no parallel in all past history. The cumulative loss to the nation now of inadequate highways is prohibitive." He continued:

TRAFFIC INCREASE

At the end of this year (1927) we estimate that there will be in service on the highways about 23,300,000 motor vehicles, an increase of about 6 per cent over last year. There will have been consumed during the year, according to our present estimates, 10,720,000,000 gallons of gasoline, an increase of 9 per cent over last year. If there was an average operation of 12 miles per gallon, the combined rural highway and city street costs for the year were about one cent per vehicle mile. At a retail price of 20 cents per gallon, the value of the fuel consumed is \$2,144,000,000, which is more than one-third the gross operating revenue for the fiscal year ended last June, of all the first-class railroads of the United States, constituting 95 per cent of the total railroad mileage. Also, it is double the income for all rural highway purposes. The use of gasoline by the individual motor car is estimated now at 460 gallons for the year, an increase of 3.6 per cent over last year. It appears, therefore, that in addition to a 6 per cent increase in the number of vehicles in use, the use of the vehicles themselves is increasing. The indicated total utilization of our rural highways and our city streets approxi-

mates, for this year, 128,000,000,000 vehicle-miles, a total so far beyond our comprehension that it fails to assist us greatly in visualizing the physical dimensions of the highway construction and maintenance necessities.

TOO MANY "UNNEEDED" ROADS

The tremendous mileage of two million miles of earth roads is composed largely of roads found along the section lines principally in the agricultural states. There is no question now but that a very large part of this mileage could be turned back into farm lands with corresponding public and private benefits. The traffic over the roads does not justify their existence as public highways. Surfacing has been applied to 274,910 miles. Of this, 82.3 per cent is of the lower types, which may or may not be transitory. In this class lie many miles of roads within metropolitan districts which will have to be improved to a high type.

PLANNING NEEDED

It must be evident from this discussion that two general policies are sorely needed in the management of local roads: First, planning commissions for metropolitan areas to lay out a system of roads for the area as a whole, although there will be found in such areas an astonishing number of civil jurisdictions. Cook County, Ill., and Cuyahoga County, Ohio, transitory surfaces sustain this fact; Second, rural planning commissions are needed to work in conjunction with the state highway department in the planning of county and feeder roads for the purpose of planning a system of public highways that will reach and serve the agricultural population with a minimum possible mileage.

NEARLY THREE BILLION PASSENGER MILES

The surfacing of the state systems is proceeding at the rate of approximately 20,000 miles per annum and the surfacing of the local roads is proceeding at the rate of about 25,000 miles per annum, but the percentage of the types are not changing materially. There are certain logical conclusions of particular interest to the asphalt industry which may be summarized as follows:

First. Based on an annual utilization of the highways of 128,000,000,000 vehicle miles, the annual passenger mileage is approximately 2,880,000,000 miles. This is not less than eight times the passenger mileage of the steam railroads in 1925, and is indicative of the predominating use of the highways by the people. The annual loss of surfacing from the low type roads, plus the dust nuisance, means that more effective materials must be found and more largely utilized both for holding these surfaces and for dust suppression. This is a field for bituminous construction.

SUPPLEMENTAL ROAD TYPE NEEDED

Second. There is such a tremendous mileage of roads initially improved on which the surface is not

(Continued on page 35.)

Report on Study of Low Cost Roads Is Made by Highway Research Board

THE CALIFORNIA Highway Commission has received a summary of a report on investigation of low cost improved roads prepared by C. N. Conner of the Highway Research Board, Washington, D. C., December 2, 1927.

INTRODUCTION

The investigation was conducted more in the nature of a survey of the low cost road situation than as a detailed and scrutinizing research. This procedure appeared advisable on account of the present need of a large mileage of low cost roads. Here are the conclusions set forth:

The subject must receive study and investigation if highway service is to keep pace with motor vehicle registration and the increasing radius of travel by motorists, for it has been truly said that we pay for roads whether we have them or not. The sum we pay for not having roads has never been estimated nor can all the benefits be stated in dollars and cents.

The public at large is interested in improved road service, while the road builder is concerned with furnishing this service at a low cost for construction and maintenance.

The selection of type for these roads may be affected by character and intensity of traffic, interest on investment, cost of replacement, maintenance cost and that somewhat intangible item, cost of vehicle operation.

Calculations based on all of these items has indicated to some persons the selection of a high type surfacing.

However, in many of the west, middle west and southern states advantage can not be taken of the absolute and theoretical economics of the situation if transitory or even temporary service is to be given.

These sections of the country represent a tremendous area, they contain a small population per unit of area and they need a large mileage of serviceable roads.

Some of these states have no treated surfaces and less than 10 miles of pavement whereas some of the northeastern states have no untreated surfaces and several thousand miles of pavement in their state highway systems.

Within a few years many have constructed and are maintaining thousands of miles of low cost roads. Many of these roads furnish continuous service between objectives. Over them the public is traveling in safety and comfort, and at high rates of speed.

This has been made possible by extensive use of local materials and intelligent maintenance.

The successful low cost surface is a light traffic road, carrying less than 1500 vehicles per day as a maximum with an average of 600 or less. This may be mixed traffic with a fair percentage of light trucks and an occasional heavy truck.

Low cost roads of this type will adequately meet the needs of a large area of the country for many years to come, provided intelligent maintenance methods are perpetuated.

In order to determine which types of surfacing and what points of interest on these would be useful

to road builders, a canvass was made which showed the points of interest to be: 1. First cost. 2. Maintenance cost. 3. Traffic and service.

Other points included conditions of climate, salvage, soil and subgrade, construction and maintenance methods, typical cross section and topography.

Preference for types to be investigated was affected somewhat by the local conditions surrounding the persons questioned but the majority favored the following order of importance:

1. Bituminous surface treatments of gravel, stone, slag and miscellaneous materials.

2. Bituminous macadam and various types of bituminous concrete.

3. Untreated surfaces of traffic-bound stone or gravel, water-bound macadam, earth and sand clay.

4. Nonbituminous surface treatments of gravel, earth and sand clay.

The principal binders or admixtures are asphalts, tars, calcium chloride, lime and Portland cement.

The principal aggregates are gravel, sand, stone or slag, and sand clay.

In the asphalt field the slower curing asphaltic oils are becoming less popular. Cut back asphaltic materials appear to be gaining in popularity.

Hot asphalt or hot tar as a second application in dual treatment work satisfies several state highway departments.

Premixed asphaltic surfaces are generally hot mixtures. Cut backs are being tried for mixed-in-place, premixed surfacing and cold penetration macadam. Cold tars for surface treatment and mixed-in-place types of surfacing are giving good service in several states.

A new type of premixed surfacing is a cold patch tar mixed with stone in a concrete mixer.

Bitumens are the most widely used binder in the low cost surfacing field.

Calcium chloride to lay dust and prevent loss of binder is used extensively near its source of supply. Sulphite liquids are *not now* used to any appreciable extent.

Natural rock asphalt when near its source has entered the field of low cost surfacing.

Portland cement with local sand or local fine gravel as an aggregate is a departure from former standards. The possibilities appear good for obtaining a serviceable pavement with these aggregates, provided expansion and contraction are properly controlled.

Hard crushed stone or dense hard slag are preferred to sand and gravel in dual treatment work of the penetration type.

Softer and more friable crushed stone when used for this purpose is specified in larger than customary sizes of hard stone.

There is a general preference for crushed materials in surface treatment work.

Clean gravel and clean coarse sand for this purpose on account of availability and comparatively low cost, are still a popular cover material.

Aggregates for mixed-in-place surfaces are generally those in the roadway surfacing itself. Examples are the work in Wisconsin, California, Indiana and the test road in South Carolina.

Cold penetration macadam is being built in the United States with cut back asphalt or tar and in Europe with emulsions.

MAINTENANCE METHODS

There are three principal methods of keeping a road surface serviceable.

1. Addition of new materials which are similar to those in the existing surface.
2. Blading and dragging.
3. Patching.

All three methods including scarifying may be necessary on any one type of road.

COSTS OF CONSTRUCTION AND MAINTENANCE

Considering the costs and types of construction in the state highway systems only, the following table is made, for an assumed width of 18 feet:

Types costing less than \$10,000 per mile.

Type	Miles
Sand clay and top soil-----	11,395
Gravel, chert, shale, etc.-----	79,286
(Treated and untreated.)	

Total ----- 90,681

Types costing more than \$10,000 per mile (including base).

Type	Miles
Water-bound macadam-----	18,428
(Treated and untreated.)	
Bituminous macadam by penetration-----	12,927
Sheet asphalt and Bit. concrete-----	5,706
Portland cement concrete-----	31,936
Block pavements-----	3,380

Total ----- 72,377

Surfaces costing more than \$10,000 per mile are about 45 per cent of the total, and less than \$10,000 are 55 per cent.

If we classify on a \$20,000 basis then water bound macadam with and without surface treatments come below this figure. We then have 33 per cent costing more than \$20,000 per mile, and 67 per cent costing less.

Selection of type is greatly affected by the availability of local materials.

SERVICE

Road service is frequently reckoned on the cost of maintenance per vehicle-mile or per ton-mile. There is no good reason for not including the cost of construction.

A few states are trying to make their selection of type on the cost of maintenance basis. Reports indicate that they have not made definite conclusions as a result of their observations.

Based on statements and claims made by highway engineers in responsible authority, the following data are presented:

Sand clay surfaces cost from \$1,000 to \$2,400 per mile, they will carry from 150 to 550 vehicles per day, including light trucks, at an annual maintenance cost of \$300 to \$600 per mile.

Gravel surfaces cost from \$4,000 to \$10,000 per mile and will carry from 250 to 550 vehicles per day including light trucks, at an annual maintenance cost of \$300 to \$600 per mile.

Untreated water-bound macadam surfaces cost more than gravel.

Traffic-bound stone, slag and gravel surfaces cost about \$2,000 per mile the first year, \$1,000 the second,

Rice Hulls Prove Help to Contractors in Handling Wet Material

Grading operations conducted in the winter months have caused contractors considerable expense and loss of time in handling wet materials. Certain soils and clays are more or less tenacious upon absorbing a small quantity of water, and, although passing through the bucket on the power excavating equipment without any great difficulty, once they are loaded into trucks or other hauling equipment and transported any distance the load often has to be reexcavated by hand before it will discharge.

Contractor Ariss-Knapp Co., who have a contract for grading and bituminous macadam surfacing between Dublin and Hayward in Alameda County, have adopted a novel procedure to overcome this difficulty. Rice hulls are being used to dust the beds of the trucks between each load. This light covering is sufficient to start the load and it discharges readily when the truck bed is raised.

These hulls are a waste product at all California rice mills and may be secured for the trouble of hauling away. On this particular work the source of supply at Oakland was approximately thirty miles from the work.

In case of an auto wreck, who should speak first? And should the man precede the lady through the windshield?—*Nebraska Awgwan.*

and \$500 the third, they will carry 300 to 600 vehicles per day including light trucks.

Dual bituminous treatments on good substantial bases cost \$1,000 to \$3,500 per mile for the first year, and will carry from 700 to 1000 vehicles per day, including light trucks, at an annual maintenance cost of \$400 to \$1,000 per mile.

Mixed-in-place bituminous surfaces depending on their thickness are costing from \$1,000 to \$4,500 per mile, and are reported to be carrying about the same traffic as dual treatments at about the same maintenance cost.

They are smoother riding than dual treatments, and they should be more durable.

Premixed surfaces and penetration macadam cost from \$8,000 to \$15,000 per mile and will carry from 1500 to 2500 vehicles per day at an annual maintenance cost of from \$200 to \$500 per mile.

The data indicate that low cost improved surfaces will give road service at about the same cost per vehicle-mile for construction, maintenance and interest on investment as for higher cost surfaces.

Low cost road surfaces in the past have failed principally from overloading and the lack of intelligent maintenance.

With proper regulation of these two important factors low cost improved roads can be built and continued in service.

OUTSTANDING WATER
ISSUES IN STATE AS THEY
DEVELOPED IN THE PAST YEAR

(Continued from page 2.)

of appropriation during the period 1919 to 1923, inclusive, is easily noticeable as is also the sharp upward trend of the curve during the period July 1st, to December 31, 1927, caused by the appropriations by the Department of Finance on behalf of the state. This plate also indicates that roughly speaking only one second-foot out of every seven applied for is allowed. This latter fact is especially significant as indicating the service performed by the Division of Water Rights in removing definitely from the field of development enterprises which were undertaken but abandoned or for one reason or another were refused a permit.

THE YEAR'S RECORD

During the year 466 applications were received, 248 applications were approved, 237 applications were denied and 86 licenses were issued. Field investigations were made of some 325 projects and hearings were held upon 128 projects. Bulletin 5 with some supplemental memoranda, has been published covering the San Gabriel investigation and one new investigation has been undertaken—that covering the water resources of Ventura County.

ADJUDICATION PROCEEDINGS

Two new adjudication proceedings were initiated during the year—one involving the waters of Emerson Creek in Modoc County and one involving the waters of Los Alamos Creek in Santa Barbara County. In addition to surveys and investigational work on these two streams similar work on North Cow Creek, Oak Run Creek and Clover Creek in Shasta County and Butte Creek in Siskiyou County was continued. Preparation of findings in connection with Whitewater River and Shasta River adjudication proceedings has progressed. The Stanislaus River case still awaits action by the superior court of San Joaquin County.

The following streams were administered during the year—Owl, Soldier, Emerson and Cedar creeks in Modoc County, Hat, Burney, North Cow and Oak Run creeks in Shasta County, Butte Creek and Shasta River in Siskiyou County. Administration of Kings River continued during the year as did also the work of the Sacramento and San Joaquin Water Supervisor on the Sacramento River and San Joaquin River.

GRAVEL ROADS IN
FEDERAL-AID SYSTEM

Gravel roads predominate in the 55,903 miles of Federal-aid roads constructed through the country, according to percentages recently published as follows:

	Per cent	Mileage
Gravel type	35.5	19,845.56
Graded and drained	23.2	12,969.50
Concrete pavement	22.0	12,298.66
Sand-clay	8.1	4,528.14
Bituminous macadam	5.6	3,130.57
Bituminous concrete	2.4	1,341.67
Water bound macadam and other types	3.2	1,788.90
Totals	100.0	55,903.00

During the past year there were improvements on 9,400 miles of the Federal-aid system, bringing the total improved highways in the system to 55,903 miles.

Vermont Votes Bonds

A bond issue of \$8,000,000 for highways and bridges has been voted by the legislature of Vermont, which was called in special session to consider plans for relief and reconstruction after the flood of last fall. Authority to borrow \$1,000,000 on short-time notes during the ensuing year was also granted. The bond plan was proposed by the governor and the vote in the legislature was unanimous.

Vermont had begun early in 1927 on an auspicious program of road construction, to be financed on a pay-as-you-go plan. The damage by the flood made it necessary to use current funds for road and bridge repairs and threatened to upset the construction program, but the bond issue will permit construction to continue through 1928 as originally planned.

Removing Snow from Mountain Roads

(Continued from page 24.)

Do not put chains on unless you absolutely have to have them, as they shake the truck violently, and you can not make any time. However, at times chains are needed for a mile or so. Put them on when necessary, and take them off as soon as you get through the ice.

When you return to shed, never leave until you have first filled your truck with gas and oil and checked your lights, so truck will be in readiness for the next run.

Large reservoirs of hydroelectric plants have proved their effectiveness as a means of flood control in at least two instances during the recent high waters in New England, according to Henry I. Harriman, president of the New England Power Company. In the extreme upper valley of the Connecticut River and in the valley of the Deerfield, one of its Massachusetts tributaries, he pointed out, there was a freedom from floods as impressive as the crushing flood damage in the Winooski and lower Connecticut valleys. This was attributed to the presence of reservoirs on the two former streams.

STATE HIGHWAYS NEED STATE VISION

(Continued from page 4.)

viewed, this does seem to be an injustice. Perhaps to some extent and in some instances it is an injustice, and the present Highway Commission is not unmindful or inconsiderate of these facts or aspects. But the public should bear in mind the more important fact that traffic requirements are the prime factor in road building, and that these requirements may be much more urgent and even necessities on roads not included in any of the bond issues than on those so included. Changed conditions, shifts of traffic, new developments, many elements enter into the relative values of highways as a means of meeting public requirements and necessities.

It is obvious, of course, that state highway construction and extension should serve the purpose of a well balanced development of the entire state, not merely geographically but with due and equitable regard to agriculture, mining, manufacturing, commerce, recreation and the tourist business. So there should be no conflict, but only a healthy rivalry, between or among any of these interests. When agricultural districts complain that their development is retarded or made wholly impossible because state highway money is expended on recreational or scenic roads instead of on roads that would enable them to get their products to the local markets, at least a partial answer is that without recreational and scenic roads there would be no local markets. And when recreational and tourist interests are disposed to over-estimate their importance, as compared with that of agricultural interests, they may be truly answered in large measure, by saying that they must be fed and serviced in a score of ways that are dependent on local agriculture.

Between the northern and southern parts of the state there can be no sensible or justifiable conflict of interests in highway construction. An equitable division of funds has been effected by both law and policy, and the average character of development in all parts of the state is essentially the same. Time was when recreational and tourist business was largely confined to southern California, and it is still more prominent and extensive in that part of the state than in the central and northern parts; but its development in the latter parts during recent years has been tremendous, and the unquestionable attractions and resources of these parts are such as to give assurance of the continuance of such

development on an ever increasing scale. Every mile of good roads built in northern California will benefit southern California almost if not quite equally with the very county in which it is built, and the same is true with respect to the benefits that will accrue to northern California by the building of good roads anywhere south of Tehachapi.

So, with all interests and all sections of our great and beautiful state catching the vision of its ultimate beauty and greatness, let us move forward toward our shining goal.

SUPPOSE

If all that we say
In a single day,
With never a word left out,
Were printed each night
In clear black and white—
'Twould prove queer reading, no doubt.
And then just suppose,
Ere one's eyes he could close
He must read the day's record through:
Then wouldn't one sigh,
And wouldn't he try
A great deal less talking to do?
And I more than half think
That many a kink
Would be straightened in life's tangled thread,
If one-half that we say
In a single day
Were left forever unsaid.

—Author Unknown.

"Mr. Florish," blabbed the great Badzib, emotionally, "I been drinkin', been in poker games two days an' now I gotta go home and face m' wife. I want shome flowers."

"A difficult situation," responded the florist. Still, some appropriate blossoms may assuage the lady's wrath. What would fit her general characteristics? Roses? Daisies? The delicate jasmine flower?"

"Gimme shome tiger lilies."

PEP

Vigor, vitality, vim and punch—
That's Pep!
The courage to act on a sudden hunch—
That's Pep!
The nerve to tackle the hardest thing,
With feet that climb and hands that cling:
A heart that never forgets to sing—
That's Pep!
Sand and grit in a concrete base—
That's Pep!
Friendly smile on an honest face—
That's Pep!
The spirit that helps when another's down,
That knows how to scatter the blackest frown,
That loves its neighbor and loves its town—
That's Pep!
To say "I will"—for you know you can—
That's Pep!
To look for the best in every man—
That's Pep!
To meet each thundering knockout blow,
And come back with a laugh, because you know—
You'll get the best of the whole darned show—
That's Pep!

—Grace E. Bostwick.

Exposition Exhibits Show Devices to Add to Motoring Safety

Gathered at the Chicago Coliseum last month were the products of 232 manufacturers of automotive service tools, accessories and replacement parts. These were on exhibition as a feature of the twelfth annual convention and ninth annual exhibit of the manufacturing members of the Automotive Equipment Association. Of outstanding interest to motorists were the items shown which will result in safer, more comfortable, and more economical motoring.

Brake equalizing machines are today of greater importance than ever before. Present high-speed traffic plus four-wheel brakes makes this so. One of the brake equalizing machines on exhibition consisted of a large steel rack on which the car is run. On this rack are two electric motors driving one pair of rollers at the rear of the car and another pair at the front. These rollers are located so that they are directly under the wheels of the car. Then they are set in motion by the electric motors. As the brakes are applied the resistance they set up is read on a separate dial for each wheel. In this way the service man can quickly get just the right adjustment, which results in quick stopping without skidding.

HELPS FOR REPAIRMEN

Greater accessibility of the under side of the present-day low-swung cars is assured by several interesting car hoists. Two of these are similar, in that the car is driven on the hoist, while it is flat on the floor. When the car is in place an electric motor raises a pair of parallel bars that engage the axles and hoist the car, leaving the wheels free for any needed adjustment.

Improved heating of automobiles is doing much to make motoring pleasant the year around. This year the show included more heaters than ever before, two steam, and one hot water type being unusual.

The steam heaters have copper units that are placed in the exhaust manifold. There is a liquid in these heating units that gives off steam almost as soon as the car starts. This steam rises to the heater in the car, and before the car has gone a quarter of a mile the heater is hot. The hot water heater takes the water from the engine, circulates it through the heater in the car and returns the water to the engine to be heated again. While this heater is slower to get hot, it will hold its heat longer when the car is parked.

SMOOTHING THE BUMPS

Shock absorbers of different kinds are offered to make riding smoother. In addition to several of the hydraulic types, there are a few new types operating on the snubber plan, while the kind that clamps to the spring leaves seems also to be gaining in favor.

The old hand methods of fitting bearings are obsolete. Reamers which work with the same precision used in production are now available to service stations. These reamers turn out better work in shorter time than is possible by any other method. By means of fine adjustments these reamers can work to limits as close as one-half of one-thousandth of an inch, or about one-half the thickness of a human hair.

We are told that "this year's world output of motor cars will run into millions." We are glad of this hint, and will try our best not to be one of those millions.—*Liverpool Weekly Post*.

Low Cost Roads to Assist Agriculture

The Highway Research Board of the National Research Council met on December 3d for the last important national highway meeting of 1927.

Highway officials heard important reports on the subject of highway construction, maintenance and operation. Among the most important of these reports was a report on low cost improved roads, with recommendations for the methods of construction of agricultural highways.

"The Highway Research Board will recommend the methods that may be used in the construction of thousands of miles of low cost roads throughout the United States," said Mr. Upham, director of the board. "The practicability of highways costing less than \$5,000 per mile has been conclusively proven where the amount of traffic to be handled is comparatively light.

The immediate construction of these roads is essential to the proper development and prosperity of American agriculture."

Excellent Progress Made by Convicts on Highway



The above photograph shows the progress of convict work on the state highway between Mariposa and Briceburg. This construction work is making a great improvement in the existing road by reducing curvatures and generally bringing the road nearer to present-day standards. Reports show that the work is progressing very satisfactorily and much improvement has been made since the camp was moved to its new location in September.

A new estimator in a contractor's office said to his boss, "Say, I've added these figures up ten times."

"That's fine," exclaimed the boss.

"Yes," said the estimator, "and here are the ten answers."

"A lady had taken her three-year-old son into the booth while her husband voted in that adjoining. When they met, after casting their ballots, the little chap said to his father:

"'Daddy, mother must love all the politicians.'

"'How is that?' the father wanted to know.

"'Well, I saw her mark kisses after a lot of their names.'"

THE NEW WOMEN'S PENITENTIARY

(Continued from page 6.)

a general office, an office for the assistant superintendent, an office for the superintendent, an examination room and a waiting room for inmates. A recreation room of ample size equipped with moving picture machine occupies the remaining space on the main or south front of the building on the first floor. Adjoining the spaces just described is a large area extending entirely across the width of the building which is available for carrying on various industries in which the women can advantageously be employed; this area is exposed to the east and west sides of the building, thus getting ample natural ventilation and in addition to the daylight from the exterior windows, gets light from two large skylights which are fed with light from two interior light courts which begin at the level of the second floor. The size and arrangement of this industrial space are such as to make it feasible to carry on several different kinds of industry at the same time; since this will involve dividing the women workers into several groups ample lavatory facilities have been provided in three different locations connected with this industrial area.

Next to the industrial area just described, in the rear portion of the first floor, are placed, on the east side, the main dining room, officers' dining room, kitchen, store room and cold storage spaces. These spaces are completely equipped so that the functions involved are so provided for as to be entirely self-contained as already indicated. On the west side of the building at the rear of the industrial space on the first floor are two units, one a completely equipped laundry, which will be operated by the inmates, and the other a lost privilege unit which contains four isolation cells.

There are two flights of stairs in the building, one near the front entrance, which is intended to be used chiefly by those in charge of the building, and the other near the rear entrance for the use of inmates. Both flights of stairs, however, at all story levels are closed and provided with steel bar doors which can be kept locked.

CELL ARRANGEMENT

The two upper floors contain the cells for the inmates, also a complete hospitalization unit. The cells are 7 feet by 9 feet, each to accommodate one inmate. The circulation corridors are adjacent to the exterior walls on all sides of the building except on the south

front of the second floor where the hospitalization unit is placed. There is also a central circulation corridor. All these corridors are 7 feet wide. The cell and other rooms except those of the hospitalization unit receive their natural light from two interior light courts, each 30 feet by 100 feet in size. Since these courts extend only two stories in height, they furnish an abundance of daylight, sun and air to the sleeping rooms, as already stated. These courts at the level of the second floor are available as outdoors rest and airing spaces for the inmates. Two day or sun rooms are provided, one on the second and one on the third floor; these day rooms are on the exterior walls of the building and accessible from the circulation corridors.

There is provision in the plan for an elevator should it be found desirable to install one at a future time.

HOSPITAL

The hospitalization unit on the second floor has the following rooms: Four isolation rooms for communicable diseases; a diet kitchen; a nurses' room with special plumbing; an eight-bed hospital ward with its bathroom; two sleeping rooms with bath for the superintendent and assistant superintendent; general clinic; drug room; sterilizing room; operating room; anesthetic room; doctor's office and doctor's wash-up room. In addition to these spaces there is special provision on the third floor for the treatment of venereal diseases with necessary waiting room.

Each cell is provided with its own plumbing fixtures consisting of a toilet, a wash basin and drinking fountain; each is individually heated with its own steam radiator; the window of each is controlled by the inmate, and the furnishings are such as to make the room as homelike as possible. Bathrooms are provided on both the second and third floors in separate units, each having three showers with dressing rooms and one tub. In addition there is a third bathroom with three showers and one tub on the second floor for the use of negroes.

The concrete floors in the corridors and in the hospitalization unit are covered with linoleum.

PRISON LABOR USED

The construction of the building was handled on what is called the day labor method, the Division of Architecture purchasing the necessary materials through the State Purchasing Department and employing a small percentage of paid labor; the major portion of the skilled as well as common labor

was performed by the prisoners themselves. The actual cost of the construction of the building was \$145,171 and the value of the labor of the inmates was estimated at about \$42,883, making the total value of the building to the state about \$188,054.

Code for City Tree Planting Issued by United States

Interest in making cities beautiful, which has led to a movement for landscaping urban streets, has brought tree planting to a position of some importance.

For the guidance of municipal authorities the United States Department of Agriculture has conducted a study of the adaptability of certain trees to certain purposes, and a code for town and city planting has been formulated. If a tree is to be a successful adornment of a city, it must be suited to the climate of the locality and have foliage healthy enough to withstand the dust and smoke; a root system not easily affected by unusual soil conditions, by restricted feeding areas or by pruning when street improvements are being made. It is important that the foliage should be light, open and airy and that in autumn the coloring should be vivid.

Spreading trees may be planted on broad streets, but tall, slender trees or small ones should be planted in streets that are narrow. Formal trees may appear on parking spaces in the middle of an avenue, but these should be balanced with appropriate planting along the sides.

For general urban purposes, oaks are said to be the best, though on account of their reputation for slow growth they have hitherto been little used. They are hardy and long lived and comparatively free from disease and insect attacks. Maples, on the other hand, are pronounced largely unsatisfactory. Throughout the United States, it is said, the silver maple, more than any other tree, is used for street planting; yet it is one of the least desirable, on account of its brittle wood, its shallow rooting and tendency to decay. Most of the other maples suffer from similar faults.

Poplars are not desirable for street planting, according to the study, except the tall, columnar Lombardy poplars for narrow streets. This family of trees is usually favored because it is easily propagated, easily transplanted and grows quickly; but it does not yield gracefully to the necessary pruning and its vigorous root growth near the surface works havoc with sidewalks and sewers. The cottonlike seed appendages of many varieties create a nuisance for street cleaners.

More favored by tree experts are elms, for sections where the elm leaf-beetle and the elm bark-louse have not penetrated; the honey locust, of large, open, round head and fine foliage; and the strong-growing sycamore, when given plenty of space. The basswood or linden is much admired, but often is not reliable on account of a common fungous growth that kills it. The ash and the hackberry have proved useful for street planting, the green ash being one of the few successful trees found in the arid regions of the prairie.

For the heart of the city the ailanthus, growing where nothing else will grow, is recommended. For formal effects, particularly for central parking where

taller trees are used on the sidewalk, the umbrella tree receives favorable mention; also some of the palms are suggested.

Snow Removal Program Of Eastern States

Snow removal activities of states in the snow belt, little known to Californians, are effecting an economic saving of millions of dollars to motorists, according to George S. Grant, manager of the Touring Bureau of the California State Automobile Association. Reports received by Grant from the touring department of the American Automobile Association, with which the state association is affiliated, show that more than 117,000 miles of highway are being cleared of snow and kept open to motor traffic this season. California snow removal problems are confined to the Sierra pass routes while some of the snow belt states must expend extraordinary efforts to keep main state routes open.

The roads making up the 117,109 miles to be cleared of snow are located in the thirty-six states which form the snow belt. The snow removal program of the states calls for the expenditure of more than \$5,000,000 this winter. The average per mile cost will be about \$45.

Every \$100 spent in snow removal yields an estimated saving of \$1,000 in more efficient transportation and business continuity. On the basis of these figures the communities which keep their streets and highways clear this year will reap an economic benefit in excess of \$50,000,000 this winter.

Practically 80 per cent of the nation's registered motor vehicles are in the snow belt, which means that on the basis of 17,700,000 motor vehicles registered in the snow area an investment of \$15,000,000,000 is dependent upon the problem of keeping the highways open for winter travel.

The cost of clearing the highways of snow averaged \$43.50 per mile last year and ranged from \$6.40 per mile in Virginia, on the southern boundary of the snow belt, to \$136.62 per mile in Wyoming, in the northwest.

WEED CONTROL IN HIGHWAYS

Control of obnoxious weeds within the highway right of way is each year becoming more of a burden on the maintenance organization of the State Highway Commission, officials in the Eureka branch office stated recently.

While formerly the Yellowstar thistle and mustard weed demanded the commission's attention, there has appeared within the last few years a more serious infestation known as the puncture vine.

As the activity of the State Highway Commission is necessarily limited to areas within the organization's right of way, unless full cooperation is had from the adjacent property owners and various county horticultural commissioners, the work of the highway body will avail nothing, as these areas will be reseeded from outside faster than the commission can eradicate.

United States Numbered Highways

For the Convenience of the Traveling Public a Limited System of State Roads Have Been Given Continuous Numbers Across the Country

FOR the past two years the state highway departments of the nation have been working on a plan, in cooperation with the Department of Agriculture, of designating certain through roads with numbers that would be carried continuously from coast to coast. Naturally this carries a limited mileage, but it is believed that the system approved takes care of the major part of interstate traffic.

The plan adopted provides that roads running north and south shall be odd numbers and roads running east and west even numbers. Necessarily there must be some diagonal routes joining these odd and even numbered routes. In laying out this system the highway officials felt that the simplicity of the plan adopted would be popular with the people, and in a large majority of the states the numbers chosen have already been erected. The total mileage involved in the routes selected is 96,626 miles. This includes the mileage through cities. In some instances, particularly in mountainous country, it is necessary, for short distances, that a road carry two numbers; but in such cases both numbers will be erected on the same post and it will not be at all confusing to the traveling public. The design adopted is the commonly known United States shield outline. The signs are being erected by the California State Automobile Association, and the Automobile Club of Southern California.

The following descriptions of routes having a California terminus have been received by the Department of Public Works. The roads designated by these numbers do not have any preference over other roads on the Federal-Aid Highway System, as far as construction and financing are concerned.

United States Highway No. 40

South. Total Mileage, 884

CALIFORNIA—Beginning at San Francisco, crossing the bay to Oakland, Martinez, Davis, Sacramento, Auburn, Truckee, via the Nevada-California state line west of Verdi.

NEVADA—Beginning at the California-Nevada state line west of Verdi to Reno, Sparks, Wadsworth, Fernley, Lovelock, Winnemucca, Golconda, Battle Mountain, Carlin, Elko, Halleck, Deeth, to the Nevada-Utah state line at Wendover via Wells.

UTAH—Beginning at the Nevada-Utah state line at Wendover to Mills, Salt Lake City, Kimball, Heber, Fruitland, Duchesne, to the Utah-Colorado state line at K Ranch via Vernal.

COLORADO—Beginning at the Utah-Colorado state line at K Ranch to Craig, Steamboat Springs, Rabbit Ear Pass, Kremmling, Hot Sulphur Springs, Berthand Pass, Denver, to the junction with No. 40 North and No. 40 South at Limon via Deertrail.

COLORADO—Beginning at the Kansas-Colorado state line west of Weskan via Cheyenne Wells, Hugo, Limon, Ramah, Colorado Springs, Lake George, Trout Creek Pass, Buena Vista, Leadville, Tennessee Pass, Wolcott, Glenwood Springs, Rifle to Grand Junction.

KANSAS—Beginning at Manhattan via Junction City, Abilene, Salina, Ellsworth, Russell, Hays, Wakeeney, Oakley, Sherron Springs to the Kansas-Colorado state line west of Weskan.

United States Highway No. 48

Total Mileage, 67

CALIFORNIA—Beginning at French Camp via Tracy, Hayward to San Jose.

United States Highway No. 50

CALIFORNIA—Beginning at Sacramento to the Nevada-California state line at the south end of Lake Tahoe via Placerville.

NEVADA—Beginning at the California-Nevada state line at the south end of Lake Tahoe to Glenbrook, Carson City, Leeterville, Fallon, East Gate, Austin, Eureka via Ely.

UTAH—Beginning at Thistle to Castle Gate, Price, Woodside, via Green River to the Utah-Colorado state line west of Mack.

COLORADO—Beginning at the Utah-Colorado state line west of Mack to Grand Junction, Delta, Montrose, Gunnison, Monarch Pass, Salida, Canon City, Florence, Pueblo, La Junta, Las Animas, to the Kansas-Colorado state line west of Coolidge via Lamar.

KANSAS—Beginning at the Kansas-Colorado state line west of Coolidge to Syracuse, to Garden City via Lakin.

United States Highway No. 66

Total Mileage, 2448

CALIFORNIA—Beginning at Los Angeles via San Fernando, San Bernardino, Victorville, Barstow,



Ludlow, Daggett, to the Arizona-California state line west of Topock via Needles.

ARIZONA—Beginning at the Arizona-California state line west of Topock to Kingman, Peach Springs, Seligman, Ashfork, Williams, Flagstaff, Winslow, Holbrook, Adamana, Navajo, to the New Mexico-Arizona state line west of Lupton via St. Michaels.

NEW MEXICO—Beginning at the New Mexico-Arizona state line west of Lupton to Gallup, Grant, Los Lunas, Albuquerque, Santa Fe, Romeroville, Santa Rosa, to the Texas-New Mexico state line west of Glenrio via Tucumcari.

TEXAS—Beginning at the Texas-New Mexico line west of Glenrio to Ontario, Amarillo, to the Oklahoma-Texas state line at Texola via Claude.

OKLAHOMA—Beginning at the Oklahoma-Texas state line near Texola to Sayre, Elk City, Clinton, Bridgeport, El Reno, Oklahoma City, Edmond, Chandler, Sapulpa, Tulsa, Claremore, Afton, Vinita, to the Kansas-Oklahoma state line south of Baxter Springs via Miami.

KANSAS—Beginning at the Kansas-Oklahoma state line south of Baxter Springs to Baxter Springs, to the Missouri-Kansas state line at Galena via Galena.

MISSOURI—Beginning at the Missouri-Kansas state line at Galena to Joplin, Carthage, Springfield, Lebanon, Rolla, Cuba, to the Illinois-Missouri state line at St. Louis via Pacific.

ILLINOIS—Beginning at the Illinois-Missouri state line at East St. Louis to Litchfield, Springfield, Bloomington, Dwight, to Chicago via Joliet.

United States Highway No. 80

Total Mileage, 2726

CALIFORNIA—Beginning at San Diego to Jacumba, to the Arizona-California state line west of Yuma via El Centro.

ARIZONA—Beginning at the Arizona-California state line west of Yuma to Yuma, Sentinel, Gila Bend, Hassayampa, Avondale, Phoenix, Mesa, Florence, Tucson, Tombstone, Bisbee, Douglas, to the New Mexico-Arizona state line west of Rodeo.

NEW MEXICO—Beginning at the New Mexico-Arizona state line west of Rodeo, Lordsburg, Deming, to the Texas-New Mexico state line south of Anthony via Las Cruces.

TEXAS—Beginning at the Texas-New Mexico state line south of Anthony to El Paso, Van Horn, San Martine, Pecos, Big Spring, Abilene, Eastland, Fort Worth, Dallas, Mineola, Longview, to the Louisiana-Texas state line east of Waskom via Marshall.

LOUISIANA—Beginning at the Louisiana-Texas state line east of Waskom to Shreveport, Minden, Arcadia, Ruston, Monroe, Royville, to the Mississippi-Louisiana state line at Delta via Tallulah.

MISSISSIPPI—Beginning at the Mississippi-Louisiana state line at Delta to Vicksburg, Jackson, Forest, Newton, Meridian, to the Alabama-Mississippi state line west of Cuba via Kewanee.

ALABAMA—Beginning at the Alabama-Mississippi state line west of Cuba to Livingston, Demopolis, Selma, Montgomery, to the Georgia-Alabama state line at Columbus via Tuskegee.

GEORGIA—Beginning at the Georgia-Alabama state line at Columbus to Talbotton, Knoxville, Macon, Jeffersonville, Dublin, to Savannah via Swainsboro.

United States Highway No. 91

Total Mileage, 1,388

CALIFORNIA—Beginning at Nevada-California state line south of Jean via Baker to Daggett.

NEVADA—Beginning at the Arizona-Nevada state line near Mesquite via Bunkerville, Glendale, Las Vegas to the Nevada-California state line south of Jean.

ARIZONA—Beginning at the Utah-Arizona state line north of Littlefield via Littlefield to the Arizona-Nevada state line near Mesquite.

UTAH—Beginning at the Idaho-Utah state line south of Franklin via Logan, Brigham, Ogden, Salt Lake City, Provo, Springville, Fillmore, Cave Fork, Parowan, Cedar City, St. George to the Utah-Arizona state line north of Littlefield.

IDAHO—Beginning at the Montana-Idaho state line at Monida via Dubois, Idaho Falls, Pocatello, McCammon, Preston to the Idaho-Utah state line south of Franklin.

MONTANA—Beginning at Great Falls via Wolf Creek, Helena, Boulder, Butte, Silverbow, Dillon, Lima to the Montana-Idaho state line at Monida.

United States Highway No. 99

Total Mileage, 1569

CALIFORNIA—Beginning at El Centro via Brawley, Indio, Redlands, San Bernardino, Pasadena, Los Angeles, Bakersfield, Fresno, Merced, Stockton, Sacramento, Davis, Woodland, Williams, Red Bluff, Redding, Dunsmuir, to the Oregon-California state line north of Hornbrook via Yreka.

OREGON—Beginning at the Oregon-California state line south of Siskiyou to Ashland, Medford, Grants Pass, Roseburg, Eugene, Junction City, Albany, Salem, to the Washington-Oregon state line opposite Vancouver via Portland.

WASHINGTON—Beginning at the Washington-Oregon state line at Vancouver to Kalamia, Kelso, Chehalis, Olympia, Tacoma, Seattle, Everett, Mount Vernon, to the United States-Canadian International Boundary north of Blaine via Bellingham.

United States Highway No. 101

Total Mileage, 1896

CALIFORNIA—Beginning at the United States-Mexican International Boundary at Tia Juana to San Diego, La Jolla, Encinitas, Oceanside, Capistrano, San Juan, Santa Ana, Los Angeles, Ventura, Santa Barbara, Los Cruces, San Luis Obispo, Paso Robles, Salinas, San Jose, San Francisco, San Rafael, Santa Rosa, Ukiah, Willits, Eureka, Trinidad, to the Oregon-California state line south of Brookings via Crescent City.

OREGON—Beginning at the Oregon-California state line north of Smith River to Brookings, Port Oxford, Boudon, Coquille, Florence, Newport, to the Washington-Oregon state line at Astoria via Tillamook.

WASHINGTON—Beginning at the Washington-Oregon state line at Megler to Ilwaco, to South Bend, Raymon, Aberdeen, Humptulips, Forks, Port Angeles, Port Discovery, Duckabush, to Olympia via Shelton.

United States Highway No. 199

Total Mileage, 84.

CALIFORNIA—Beginning at Crescent City to Smith River to the Oregon-California state line west of Takilma.

OREGON—Beginning at the Oregon-California state line west of Takilma to Grants Pass via Kerby.

All signs will be placed square with the road to the right of traffic direction, either alongside of headwalls of pipe culverts or from two to four feet beyond the shoulder break on fills and the bank side of ditches in cuts. Where the shoulder break is not defined, it will be considered as the outer edge of that portion maintained as travelable road width.

U. S. ROAD CHIEF TELLS ASPHALT MEN NATION'S ROAD NEEDS

(Continued from page 25.)

now adequate that a low type of supplemental construction must be developed which can be adequately maintained. As indicative of the possibilities in this field, we have a demonstration of the finest crushed rock surfaces in the west. The processing with bituminous treatments gives promise of high class service under moderate traffic at a reasonable annual maintenance cost. Furthermore, a type of maintenance is possible that renews the original smooth-riding qualities of the road. It has already been demonstrated that these surfaces can be scarified and a small amount of additional material added, and that the work can be done on a quantity basis and, which is all important, at a low cost. There may be difficulties with this type of construction, but it gives such promise that the asphalt industry, both engineers and contractors, can well afford to devote thought and effort to its perfection.

RESEARCH WORK NECESSARY

Third. There are long mileages of both the state highway and local highway systems, particularly in the regions west of the Mississippi River, on which the only hope now apparent for first class highway service lies in the development of bituminous construction. Without criticising the efforts that are being made toward the perfection in detail of the standard asphaltic mixtures for pavement construction, the attention of the industry is directed toward the desirability and necessity of developing types of construction that can be laid more cheaply than the standard types and that will prove adequate. This may very well mean making a larger percentage of the product available for use in the lower types of construction, and to do this not only the processes but the equipment, and even the material itself, must be adapted to this purpose.

MILEAGE AT LOW COST

Fourth. Again, without thought of overlooking the desirability of the more durable types of construction which have long been established as standard, the attention of the industry is directed toward the overwhelming physical problem confronting the country, which can not be met quickly by the relatively small mileages of the high cost construction that may be built with the present income from year to year. It does not appear impossible to develop processes, and the bituminous processes seem most adaptable for the purpose, that lend themselves to complete overhauling, largely restoring the roads to their original condition without impossible expense. Students of highway finance must be impressed with the fact that it is the annual cost of providing adequate highway service that is the important item, and the field of possibilities in bituminous construction has been only partially developed.

Fifth. Finally the performance of many of the older bituminous macadam roads, particularly in the northeastern states and abroad, provides confidence that this type of construction can be used under heavy traffic, provided the design and maintenance are adequate. In this field there seems to lie the possibility of more closely controlled manufacturing processes, coupled with changes in design that would insure more uniform and more satisfactory results.

THE HIGHWAY CREW

By LILLIAN TREGENZA.

Sing a song of the Highway Crew,
Emblem the pick and the spade;
Dirty the work they have to do,
Well earned the wage they are paid.

Drag and truck and shovel,
Shovel and truck again;
Slides and choked-up ditches,
The curse of the Highway men.

Dust in the heat of the summer,
Mud through the winter and fall,
Remarks from each passing auto;
The "Highway" gets it all.

The road's as smooth as a carpet,
The work is done, and then—
A Sunday's quota of autos
And it's all to be done again.

Half of the road is finished;
Covered with rocks and tar;
A string of spattered autos—
And you know what they think you are.

Just a "Men at Work" sign
Or "Road is in Repair"
Changes any country highway
To a crowded thoroughfare.

So sing a song of the Highway Crew,
Emblem the pick and the spade,
And measure the depth of their service to you
By the miles of road they have made.

[EDITOR'S NOTE.—Mrs. Tregenza is the wife of George Tregenza, maintenance foreman in the Fourth State Highway District, headquarters, San Francisco.]

HAMLET TO DATE

To park or not to park, that is the question;
Whether 'tis better to drive on farther
And hope at least to find a one-hour parking limit,
Or slip into the place near the fire plug,
And, by parking, risk a warrant.
To park right here, 'tis true,
Would save much time, forsooth end my fruitless
driving
Around the block. But darn it all! There's that
Cursed hydrant. To stop—to park—to court!
Perchance to jail; ay, there's the rub;
For in that traffic court, what fines may come
When I have shuffled up before the judge—
He might say "thirty days." I'll risk it not.

—Exchange.

Rock Shoulders Installed

The contract for placing rock borders on twelve miles of highway from Williams to Delevan has been completed. Hemstreet and Bell were the contractors.

Do You Drive Safe?

Auto-Analyze Yourself;

Here is the Test

Perhaps motor accidents would be considerably reduced if owners of cars would consult a good psychoanalyst before taking their machines out on public highways. They may have complexes which need attention. Once these are removed, or at least treated, their driving efficiency might be greatly improved. At least they can give themselves a sort of self-analysis to check up on some of their tendencies, says H. Clifford Brokaw in the New York *Herald-Tribune*.

This suggests that one reason why there are so many automobile accidents may be because motorists have not subjected themselves to a study of their own capacities as drivers. It would not take much time or trouble for an automobile owner to check up on his present situation as a driver of a car. Having found out his present status he might try out for a higher ideal.

By way of self-analysis let each motorist answer honestly for himself the following questions: Have I at any time in the past been guilty of driving a car at an excessive rate of speed?

Have I ever driven on the wrong side of the street?
Have I driven recklessly in passing children?
Or taken chances in passing another vehicle?
Failed to stop when passengers were getting off street cars?

Foiled with other occupants of car while driving?
Failed to observe recognized automobile signals?
Failed to sound the horn, as is customary?
Started from the curb into heavy traffic without precaution?

Passed a street car on the left?
Driven through a safety zone?
Disregarded the traffic rules?
Failed to cooperate with the traffic officers?
Failed to go slowly by a school building?
Turned corners improperly?
Been reckless at a railroad crossing?
Driven a car with illegal lights?
Driven incautiously past blind corners?
Backed up without looking behind?
Driven with inadequate brakes?
Stopped suddenly without warning those behind?
Parked my car next to water hydrant?
Failed to look out for jaywalkers?
Parked my car in evening without lights on?
Left my car on incline without brakes properly set?
Driven with a faulty steering gear?
Ridden without chains or non-skid tires over wet pavement?

Followed another car too closely for safety?
Entered a garage at high speed?
Driven a car I did not know how to manage safely?
Driven in a don't-give-a-rap-about-the-other-fellow attitude?

Allowed a child to catch on for a ride?
Failed to watch out for obstructions in the highway?
Neglected to exercise proper caution on curves?
Driven a car not equipped with mirror for looking back?

Driven and flirted with girls on sidewalks at the same time?
Failed to give pedestrians a fair chance?
Tried to outguess the other fellow?
Slowed down at grade crossings?
Hogged more than my share of the road?
Observed the golden rule in motoring?

New Permit Forms

Two distinct permit forms have been prepared to replace the form P-102.

Form P-102 Rev. (Transportation Permit) is to be used where moving of special load equipment, buildings, tractors, etc., is desired.

Form P-202 (Encroachment Permit) is to be used for encroachments, or work by outside parties within the highway right of way limits.

The new forms should simplify the preparation of your permits and save time in typing and reviewing them as well as insuring uniform practice throughout the state.

State Highway Progress Reports

IMPERIAL COUNTY—Excellent progress is being made by Contractors Ward and Gabler, on the grading of 2.1 miles of highway on the San Diego-El Centro Highway at the lower end of Mountain Springs grade. This project is to replace that portion of the original highway destroyed by floods a year ago. At present traffic is routed over a temporary oiled road following the bed of the wash. This highway is of strategic importance to Imperial Valley since it is the principal means of commercial activity between the valley and the city of San Diego. Since a large percentage of the produce of the valley is perishable, continuous service is imperative. A possible repetition of last year's flood disaster will be eliminated when the present project is completed.

FRESNO COUNTY—The extension of all the narrow culverts in Fresno County on the Golden State Highway is being undertaken this month. The elimination of these "bottle necks" will greatly improve traffic conditions on this heavily traveled road.

The road through General Grant Park and into Hume is still open though covered with approximately 8 inches of snow. Chains must be used on the grades east of the park.

KERN COUNTY—Considerable widening has been done on the Maricopa grade into Cuyama Valley on Route 57 and on this road which also extends through Kern River Canyon and Walker's Pass, culverts are being installed and some shovel work is proposed to eliminate some of the more dangerous points.

Snow fell recently on the Ridge Route but not enough to seriously inconvenience traffic.

MARIPOSA COUNTY—Traffic into Yosemite Valley is increasing considerably over the holiday period. There is plenty of snow in the valley. Mirror Lake is frozen over and is being used for skating and sledding.

The state highway from Merced to the park entrance is in good condition though slightly slippery between the Merced County line and Mariposa, during rainy weather.

MERCED COUNTY—A much needed improvement on the Pacheco Pass Highway is 9 miles of crushed rock borders which are being placed through the adobe sections by Larsen Bros. of Livermore.

RIVERSIDE COUNTY—The Maintenance Department has started the oiling of 10.5 miles of sand shoulders on the Los Angeles-Imperial Valley Highway from Oasis north. The oiling is to cover a strip three feet wide along each edge of the pavement, thereby increasing the effective width of traveled way. This is one of the few improved highways in the state where the motorist is confined to the bare width of the pavement; due to the soft sandy shoulders, the edges of the pavement form lines outside of which he dare not turn his wheels. Vehicles having the maximum

legal width of ninety-six inches are common on this highway and must actually overhang the pavement edges in passing. Correction of this dangerous condition is the goal sought by the Maintenance Department in their present oiling project.

SAN BERNARDINO COUNTY—Foothill boulevard—The first 0.3 mile of the Foothill boulevard west of San Bernardino is under contract for reconstruction. The new pavement will be of asphaltic concrete 30 feet wide. Contractor Steele Finley is erecting his asphalt plant at Rialto preparatory to laying the pavement. His activities on the road up to the present time have been confined to the construction of the necessary drainage structures.

Another phase of the Foothill boulevard reconstruction is under way in the form of the construction of culverts at the Banana avenue intersection near Fontana. This is being done in cooperation with the Fontana Farms Company who are improving Banana avenue.

Redlands to the San Bernardino-Riverside county line—The preliminary work of grading and installing drainage structures on Matich Bros. contract has been cleared away and the actual paving work begun. The new pavement is being constructed of Portland cement concrete 20 feet wide. Crushed rock shoulders 2½ feet wide will be placed along each edge of the pavement from material salvaged from the old oiled macadam pavement.

Crest route—The construction program on the new high gear road from San Bernardino to Big Bear Lake took new life on December 13th when the United States Department of Agriculture opened bids for grading 3.5 miles of mountain highway from Waterman Canyon toward Squirrel Inn. This project stands out among other projects of the Department of Agriculture as one of the heaviest mountain grading projects yet undertaken. The lowest bid on the 3.5 mile section as submitted by J. G. Donovan & Son, Los Angeles, was \$339,700. When this contract is completed there will remain approximately 2 miles of similar work to be done by the Division of Highways to complete the road to Squirrel Inn.

The improvement between Squirrel Inn and Running Springs Park is continuing as usual by the Division of Highways. The gas shovel which has been in operation since August, 1926, has advanced from the Running Springs end through the Allison Ranch in distance a little over four miles.

Banana avenue pavement and storm channel intersection—While engaged in our highway building program with the Department of Public Works, we often become aware of other "Builders of California" and we sometimes find it possible to cooperate with them to mutual advantage. These opportunities come to light through frank discussion of the needs of the highway and their relation to adjacent projects with a willingness to cooperate when a common benefit can be obtained.

An example may be cited in the recent agreement with the Fontana Farms Company who are among our neighbors along the Foothill boulevard west of San Bernardino. As a part of the Foothill boulevard improvement program, we are cooperating with them in constructing a storm water crossing and street connection at Banana avenue. This company is confining the storm waters to a single channel above and below the highway in a combination storm channel and street pavement. This work is beneficial to them in protecting their lands from storm water damage. Heretofore these storm waters have crossed the state highway pavement over a considerable width and the approaching channel was neither well defined nor permanent. The construction of culverts was therefore

impractical and traffic was subject to interruption during storms. Our cooperation consists in constructing the necessary culverts to meet the Fontana Farms Company storm drain and highway travel will no longer be interrupted during storms.

TULARE COUNTY—Dangerous curves on the Sierra-to-the-Sea Highway have been widened and surfaced with oil macadam and this road, which connects with the General's Highway in Sequoia National Park, is in good shape.

December Proceedings of Highway Commission

The California Highway Commission held its regular session for December on December 7 and 8, 1927, in San Francisco. The following business was transacted:

SMITH RIVER BRIDGE

The Director of Public Works was authorized to prepare plans and specifications, and, subject to the approval of the Department of Finance, proceed with a contract for construction of a bridge over the Smith River on Route 1, Del Norte County, east of Crescent City, at an estimated total cost of \$150,000, the state to be reimbursed by Del Norte County for a portion of the cost to the extent of \$60,000.

GRADE SEPARATION SOUTH OF SALINAS

Subject to the Department of Finance, the sum of \$50,000 was voted as the state's share of a grade separation on Route 2, located 5 miles south of Salinas in Monterey County.

COMPROMISE OF FORFEITURE

It appearing that J. F. Knapp on Contract M-151, Rincon highway, between Ventura and Santa Barbara, had permitted certain workmen employed by Mr. Knapp in construction of this highway, to labor more than eight hours for one calendar day, and it further appearing that such violation was in part due to extraordinary emergencies to prevent injury to life and property, and it being impossible to determine the exact amount of work performed, in violation of the law as distinguished from that performed under extraordinary emergencies, a compromise of \$1,000 was made as full settlement of all violations upon this job prior to the date of settlement. This compromise was suggested by the Chief of the Division of Labor Statistics and Law Enforcement of the Department of Industrial Relations and was acceptable to the contractor, J. F. Knapp.

IMPROVEMENT WORK—SAN MATEO COUNTY

The board of supervisors of San Mateo County were granted permission to do certain work adjacent to and along a portion of the El Camino Real in San Mateo County, commonly known as the State highway. The plans and specifications for the proposed improvement were approved by the California Highway Commission.

RIGHTS OF WAY

The Director of Public Works was authorized to obtain the right of way on the Bay Shore highway from Burlingame to San Mateo.

The sum of \$12,000 was voted toward the expense of securing additional right of way for the widening of the state highway along Price street in the unincorporated town of Pismo Beach, San Luis Obispo County, from the end of the Knapp reconstruction

project, southerly, approximately 2500 feet. Said contribution is to cover in full the state's contribution for moving back buildings to the new right of way line so as to provide a width of 81 feet between property lines; the reconstruction of the sidewalks and curbs to provide a roadway width of 65 feet between curbs. It was also voted to widen the present pavement between the above limits to a width of 30 feet, providing an improvement district was formed to include the widening of the right of way, reconstruction of sidewalks and curbs, and the paving of the 35-foot balance of the width between curbs, the state to extend all drainage structures to full length between curbs at its own expense.

Resolutions authorizing condemnation of lands for right of way were adopted as follows:

Road 7, Ventura 2-F at south end of Long seawall containing about 1/100 of an acre; District 8, Imperial County, Rt. 26, fifty-nine parcels of land between Trifolium canal and Salada wash.

CONFERENCES

A delegation representing the board of supervisors and civic organizations of Marin County appeared before the Commission urging the Commission's immediate attention to the improvement of both termini of the Redwood highway. The delegation was headed by C. J. Gardener, chairman of the board of supervisors, Thomas Boyd, Assemblyman Charles Reindollar, and A. O. Stewart, president of the Golden Gate Ferry Company, all of whom were principal speakers. They urged immediate realignment and reconstruction of the highway leading out of Sausalito so as to eliminate Corte Madera grade and reroute the present San Clemente grade. They also discussed the necessity of a highway wider than 15 feet, the present width. Mr. Boyd stated that the average daily traffic was over 8000 cars, and holidays and Sundays averaged from 15,000 to 20,000 machines. The matter of a toll causeway across Richardson Bay to be built by the Golden Gate Ferry Company came into the discussion when Mr. Meek, Director of the State Department of Public Works, asked if the people of Marin County would have any objection to a toll road with a proposed charge of 10 cents. Answering this, Assemblyman Reindollar stated that the people of Marin County would welcome a shortening of the distance by a toll road and would not object to the 10-cent charge. Widening of the Redwood highway to a greater width than 15 feet from San Rafael to the northern Marin County line was also urged.

JOINT HIGHWAY DISTRICT NO. 8

A delegation representing Joint Highway District No. 8, which plans the building of about 2 miles of highway to complete the Sears Point toll road connecting Ignacio, Marin County, with Vallejo, Solano County, appeared before the Commission. The district was represented by its engineer, Assemblyman Robt. E. McPherson; its attorney, Joseph M. Raines, and its secretary, C. B. Butler. Attorney Frank R. Devlin represented the city of Vallejo. Mr. Butler urged that the proposed road would reduce distances, especially from Marin County to Carquinez bridge. He stated that it would also lessen the distance from Marin County points to Sacramento and would give an ultimate route from Sacramento to San Francisco. The cost of the project he estimated under \$60,000, of which \$22,000 would be paid by Solano County and \$8,000 by Marin County. The district is pressing the state for the balance of \$30,000. In answering, the commissioners and director voiced objection to the state contributing to a privately owned highway. No form of action was taken.

JOINT HIGHWAY DISTRICT NO. 1

Representatives of Joint Highway District No. 1 appeared before the Commission relative to future work on the Skyline boulevard. In the delegation were Supervisor Charles P. Cooley, Santa Clara County; Supervisor J. W. Poole and Thomas L. Hickey, San Mateo County; Supervisor J. D. Rostorn, Santa Cruz County; A. J. Mason, Burlingame; Charles I. Anderson, San Francisco; Fred Cairns, Santa Cruz. The Skyline boulevard is completed from the Fleishhacker pool, San Francisco, to La Honda, a distance of 33 miles. The committee urged that the unit for construction should be that portion from La Honda to Saratoga Gap, a distance of 13.9 miles.

CLOVERDALE TO HOPLAND—REROUTING

A committee representing the Redwood Empire Association requested a statement of the Commission's attitude on the rerouting on Redwood highway from Cloverdale to Hopland by way of the east side of the Russian River. Chairman Bull informed the committee that instructions had already been given for a survey of the proposed new routing.

BAY SHORE HIGHWAY MATTERS

A delegation representing the Bay Shore Highway Association appeared before the Commission to discuss matters relative to rights of way which are now being obtained in or near Burlingame. The committee was composed of J. E. McCurdy, city attorney, and Oscar Wisegerber, city manager of San Mateo; Miss Elizabeth Hole, secretary of the San Mateo Chamber of Commerce and J. S. James, city manager of Burlingame. They offered the cooperation of Burlingame in securing the right of way. Commissioner Fred S. Moody reported that he had a closed negotiation for the right of way through the Carolan Estate.

CALIFORNIA'S FIRST COMPLETE HIGHWAY BUDGET AND PROGRAM

(Continued from page 8.)

The construction program as formally adopted follows:

Santa Maria to Freeman via Bakersfield and Walker Pass.

KERN COUNTY—Maricopa to Valley route, grading, surfacing, oiling (portions), 12.5 miles, \$100,000. Bakersfield to Freeman, grading, surfacing and oiling (portions), 12.5 miles, \$100,000. Freeman to Walker Pass, grading, \$15,000.

Mojave to Arizona line near Topock via Barstow.

SAN BERNARDINO COUNTY—Daggett to Topock, grading, surfacing and oiling (portions), 45 miles, \$425,000. Daggett to Topock (Needles road), realignment, grading and surfacing, \$50,000.

El Rio to San Juan Capistrano.

LOS ANGELES and VENTURA COUNTIES—Santa Monica to Oxnard, surfacing and oiling, paving (portions), 25 miles, \$900,000.

LOS ANGELES COUNTY—Riprap protection along ocean shore, \$40,000.

VENTURA COUNTY—Riprap protections along ocean shore, \$40,000.

La Canada to Mount Wilson road via Arroyo Seco.

LOS ANGELES COUNTY—Flood protection walls, Arroyo Seco, \$25,000. La Canada via Arroyo Seco to Mt. Wilson road, grade and surfacing portions, \$200,000.

Mecca to Blythe.

RIVERSIDE COUNTY—Grading, surfacing and oiling (portions), 22.5 miles, \$225,000. Mecca to Blythe, realignment, grading and surfacing, \$50,000.

Auburn to Sonora (Mother Lode Highway).

CALAVERAS COUNTY—Mokelumne Hill to Angels, grading, surfacing, oiling (portions), 5 miles, \$100,000.

AMADOR COUNTY—Drytown to Martell, grading, surfacing and oiling (portions), 4 miles, \$75,000.

TUOLUMNE COUNTY—Shaws Flat to Sonora, grading, surfacing and oiling (portions), 1.5 miles, \$20,000.

Manteca to point near Mossdale store.

SAN JOAQUIN COUNTY—Mossdale to Manteca, grading, surfacing and oiling, 2 miles, \$50,000.

San Francisco to San Jose (Bay Shore Highway).

SAN MATEO COUNTY—Grading, surfacing and oiling. San Francisco to South San Francisco, 4.8 miles, \$625,500. Surfacing and oiling. South San Francisco to Broadway Station, 5.2 miles, \$150,000. Grading and surfacing. Broadway Station to San Mateo, 3 miles, \$180,000. Visitacion Valley to South Francisco, crushed rock shoulders, \$15,000.

San Rafael to San Quentin.

MARIN COUNTY—Grading, surfacing and oiling, 3.1 miles, \$120,000.

Sierra-to-the-Sea.

FRESNO AND MONTEREY COUNTIES—Work on Mustang Grade, \$51,000.

San Francisco to Oregon line at Monumental.

DEL NORTE COUNTY—Hunter and Minot Creek bridges and approaches \$50,000. Grading and surfacing from south line of county to Richardson Creek, \$200,000. Grading for 0.83 miles and surfacing 7.23 miles, Klamath River to Wilson Creek, \$250,000. Completing grading and surfacing Elk Valley road to Smith River, \$46,000. Protection work, Adams Station to Oregon line (cooperative project) \$100,000. Surfacing, Patrick Creek to Oregon line, 17.6 miles, \$85,000. Oiling, Elk Valley to Oregon line, 39.6 miles, \$85,000. Oiling, Orick to Richardson Creek, 20.5 miles, \$35,000. Oiling and rocking, Wilson Creek to Crescent City, 15 miles, \$60,000. Southerly boundary to Wilson Creek, realignment, widening and surfacing, 10.6 miles, \$10,000.

HUMBOLDT COUNTY—Bridges over Lost Man and Prairie creeks, \$35,000. Grading and surfacing, Fortuna to Fernbridge, \$46,000. Eureka to Beatrice, widening and second story, 8.3 miles, \$125,000. Beatrice to Loleta, realignment, grading and surfacing, 4.3 miles, \$125,000. Robinson Ferry bridge, \$20,000. Orick to northerly boundary, realignment, widening and surfacing, 15.8 miles, \$20,000.

SONOMA COUNTY—Santa Rosa to Willowbrook, realignment, grading, widening, and second story, 11.4 miles, \$300,000.

MARIN AND SONOMA COUNTIES—San Rafael to Ignacio, grading, widening, surfacing, 10 miles, \$300,000.

MARIN COUNTY—Miller Creek bridge, \$21,000. Coyote bridge repair, \$10,000. Novato Creek bridge, \$20,000; from Alto to San Rafael, \$300,000; balance needed to complete work on this section to be allotted out of first money available.

San Francisco to San Diego

SANTA CLARA COUNTY—Sargent grade separation and approaches (state's share), \$70,000. Santa Clara, northerly, crushed rock shoulders and second story, 4.7 miles, \$200,000.

MONTEREY COUNTY—Spence grade separation and approaches (state's share), \$75,000. Salinas, northerly, widening and resurfacing, 1.9 miles, \$55,000. South of San Ardo, realignment, grading and surfacing, 0.6 mile, \$40,000. Bituminous top on pavement at intervals totaling 5 miles, \$30,000. Minor line change, \$35,000.

SAN LUIS OBISPO COUNTY—Pismo to San Luis Obispo, realignment, grading, second story, and resurfacing, 10.4 miles, \$450,000. Arroyo Grande to Pismo, realignment, grading, resurfacing 3 miles, \$106,000. Line changes north of San Luis Obispo, grading and surfacing 1.4 miles, \$50,000. Trestle over Santa Fe Creek, \$60,000.

SAN LUIS OBISPO AND SANTA BARBARA COUNTIES—Arroyo Grande to Zaca, macadam shoulders, 4.5 miles, \$135,000. Line changes, grading and surfacing, \$30,000.

VENTURA COUNTY—Rincon Creek bridge, \$40,000. Paving on Conejo grade, \$10,000.

VENTURA COUNTY—Paving on Conejo grade, \$10,000. Benham subway (state's share), \$40,000.

SANTA BARBARA COUNTY—Rincon Hill, realignment, grading and resurfacing 1 mile, \$110,000. Between Ellwood and Goleta, widening and resurfacing 3.44 miles, \$110,000. Montecito to Summerland, realignment, grading and paving 1.8 miles, \$100,000. Superelevating 33 curves, \$45,000.

ORANGE COUNTY—Fullerton to Anaheim, (co-operative paving) 0.8 mile (state's share), \$55,000. Galivan line change, grading and paving, 0.3 mile, \$30,000. Galivan, northerly, widening and second story, 5 miles, \$175,000. Santa Ana to Garden Grove avenue, widening and second story, 2.2 miles, \$100,000. Garden Grove avenue, to Anaheim, widening and second story, 2.8 miles, \$120,000. Galivan overhead, Santa Fe R. R., \$45,000. Irvine subway (state's share), \$75,000. Widening Aliso Creek bridge, \$25,000. Widening two bridges on Irvine ranch, \$15,000. Line change north of Serra, grading and paving, \$30,000.

Sacramento to Oregon line via Marysville.

TEHAMA AND SHASTA COUNTIES—Stockton and Cottonwood bridges and approaches, \$140,000.

SHASTA COUNTY—LaMoine northerly, grading and standard surfacing, 10 miles, \$650,000. Polards Gulch bridge, \$110,000. Boulder Creek bridge, \$10,000. Shotgun Creek bridge, \$14,000.

SISKIYOU COUNTY—End of present pavement to Gazelle, widening 7.7 miles, \$100,000. Four short line improvements, \$25,000. Baily Hill subway under S. P. (state's share), \$50,000.

SACRAMENTO COUNTY—North Sacramento to Ben Ali station, second story pavement, 1.8 miles, \$75,000. Small bridges and line changes between Ben Ali and Sylvan school, \$35,000. Paving curve at Sylvan school, 0.3 mile, \$10,000.

SACRAMENTO AND PLACER COUNTIES—Sylvan school to Roseville, second story pavement, 2.9 miles, \$95,000.

PLACER COUNTY—Between Roseville and Lincoln, second story or resurfacing, 2.9 miles, \$95,000.

Improving reverse curves at railroad stations, (this also includes like work on Tehama to Benicia highway), \$35,000.

Sacramento to Los Angeles.

FRESNO AND MADERA COUNTIES—Herndon bridge, \$220,000.

LOS ANGELES COUNTY—San Fernando to Castaic, grading and paving, \$350,000. Through Newhall (cooperative paving) 0.6 miles (state's share), \$26,500. Ridge Route realignment, grading, \$150,000. Ridge Route paving, \$165,000. Bituminous resurfacing 3.5 miles, \$37,000. Realignment near Newhall tunnel, \$30,000.

MADERA COUNTY—Tharsa to Borden, widening and resurfacing, 6.9 miles, \$145,000. Madera to Fairmead, widening and resurfacing, 10 miles, \$240,000. Berenda grade separation (state's share), \$40,000.

MERCED COUNTY—Widening culverts, \$30,000.

TULARE COUNTY—Southerly boundary to Earlihart, widening and resurfacing, 8.5 miles, \$190,000. Two 20-foot bridges, \$20,000.

SAN JOAQUIN COUNTY—Cherokee crossing to Stockton, grading and surfacing, 2.4 miles, \$45,000. Cherokee crossing to Live Oak, widening and crushed rock shoulders, 7.6 miles, \$50,000. Bridge across the diverting canal, \$45,000. Cherokee crossing to Stockton, grading and surfacing, 2.4 miles, \$45,000.

SACRAMENTO COUNTY—Arno line change, grading and surfacing, 1.8 miles, \$32,500. McConnell Station to Sacramento, crushed rock shoulder, 13.2 miles, \$30,000. Bridges between Galt and Arno, \$70,000. Bridge near Arno, \$20,000. Galt to McConnell, grading and second story, 5.5 miles, \$190,000.

STANISLAUS COUNTY—Approaches to Turlock, grading and paving, 1.2 miles, \$35,000. Realignment north of Ceres, grading and paving 0.2 mile, \$9,000. Stanislaus River bridge, south approach, \$20,000. Hatch subway, near Modesto, Southern Pacific Railroad (state's share), \$50,000. Widening two irrigation canal bridges, \$10,000. Widening four irrigation canal bridges, \$15,000. Turlock overhead crossing, Southern Pacific Railroad (state's share), \$75,000.

KERN COUNTY—Between Bakersfield and Delano, widening, surfacing with asphaltic concrete, \$450,000 (contracts already let and work in progress).

Stockton to Santa Cruz via Oakland.

SAN JOAQUIN COUNTY—French Camp to Mossdale, grading and second story, 7 miles, \$195,000.

ALAMEDA COUNTY—Dublin to Hayward, realignment, grading, and asphaltic macadam, 7.8 miles, \$390,000. Palomares Creek bridge, \$30,000. Alamo Creek bridge, \$12,500. Hollis Creek bridge, \$21,000. Cull Creek bridge, \$40,000.

ALAMEDA AND SANTA CLARA COUNTIES—Warm Springs to Milpitas, widening, resurfacing and paving, 3.7 miles, \$160,000.

Sacramento to Woodland Junction.

YOLO COUNTY—East and west of causeway, rock shoulders, second story, 3 miles, \$50,000. M street bridge, widening roadway, \$30,000.

Tehama Junction to Benicia.

SOLANO COUNTY—Southwest to Vacaville, realignment, grading, paving, 1.5 miles, \$45,000.

COLUSA COUNTY—Arbuckle to northerly boundary, rock shoulders, 26.8 miles, \$80,000. Stone Corral bridge, \$10,000. Funk Slough bridge, \$8,000.

GLENN COUNTY—Willows southerly, widening and resurfacing 3.05 miles, \$60,000. Wilson Creek bridge, \$8,000.

Ignacio to Cordelia via Napa.

SONOMA COUNTY—Black Point cut-off, surfacing and oiling, 8.5 miles, \$75,000. Line changes, grading and surfacing, \$50,000.

SOLANO COUNTY—North of Cordelia to Napa County line, grading and surfacing, 3.5 miles, \$110,000.

San Fernando to San Bernardino.

LOS ANGELES COUNTY—La Canada to Pasadena, bridges, grading and surfacing (portions), 8.5 miles, \$157,500. Pasadena to Monrovia, grading and paving (portions), 3.6 miles, \$200,000. San Dimas line change, grading and surfacing, 1 mile, \$55,000. Monrovia to Azusa, realignment, widening and paving, 2.5 miles, \$150,000. San Dimas to Claremont, widening and resurfacing, 3 miles, \$150,000. Glendora to San Dimas avenue, realignment, grading and paving, \$150,000.

SAN BERNARDINO COUNTY—San Bernardino to westerly boundary, widening and resurfacing, 20 miles, \$425,000. Pacific Electric subway near Upland (state's share), \$50,000.

San Diego to El Centro.

SAN DIEGO COUNTY—Viejas Valley, easterly, realignment, grading, paving, \$425,000. Euclid avenue to east city limits of San Diego, cooperative paving, 1.5 miles (state's share), \$45,000. Disintegrated granite surfacing, \$25,000. Between Buckman's Springs and Tecate Summit, realignment, grading and surfacing, \$55,000. San Diego to La Mesa, realignment, widening and resurfacing, 2.5 miles, \$80,000.

IMPERIAL COUNTY—Grade separation and approaches (San Diego and Arizona Railroad), \$40,000. El Centro to Dixie Land, widening and resurfacing, 12.2 miles, \$225,000. New River bridge, Bullhead Slough bridge, West Main Canal bridge, \$55,000.

Sacramento to Nevada line via Placerville.

EL DORADO COUNTY—Slippery Ford, grading and surfacing (cooperative), 4.2 miles, \$75,000. Sportsman's Hall to Riverton, realignment, grading and resurfacing (portions), \$60,000.

SACRAMENTO COUNTY—Brighton subway under Southern Pacific railroad, \$45,000.

Salida to Alpine Highway at Junction.

TUOLUMNE COUNTY—Keystone to Jamestown, surfacing and oiling, 9 miles, \$60,000. Sonora, easterly, grading, surfacing and oiling (portions) (Big Oak Flat road), \$75,000.

Albany to Martinez.

CONTRA COSTA COUNTY—Rodeo to Albany, grading, surfacing and structures (portions), 3.4 miles, \$280,000. El Cerrito to Albany, widening and resurfacing (cooperative with El Cerrito and Albany), 0.8 mile, \$35,000. Wild Cat Creek bridge, approaches, realignment, grading and surfacing, 0.3 mile, \$25,000.

Wild Cat bridge, \$30,000. Richmond to San Pablo, widening and resurfacing, 1.4 miles, \$75,000.

Tahoe-Ukiah Highway.

COLUSA AND LAKE COUNTIES—Grading and surfacing (portions), \$260,000.

Roseville to Nevada City.

PLACER COUNTY—Between Roseville and Rocklin, second story or resurfacing, realignment, 1.5 miles, \$60,000. Antelope Creek bridge, \$7,500.

Merced to point near Sequoia.

MARIPOSA COUNTY—Westerly boundary to Cathay, realignment, grading and surfacing 9.6 miles, \$275,000. Cathay to Mariposa, realignment and grading 14.3 miles, \$50,000. Mormon Bar to Briceburg, rock surfacing 15 miles, \$65,000; widening culverts, \$40,000.

MERCED COUNTY—Santa Fe grade separation (state's share), \$60,000.

West of Claremont to Riverside.

SAN BERNARDINO COUNTY—Ontario to Pomona, realignment, grading and paving, 2.6 miles, \$100,000.

Redding to Redwood Highway, near Arcata via Weaverville.

TRINITY COUNTY—Indian Creek and Grass Valley Creek bridges, \$35,000.

Saugus to Alpine Junction.

KERN and INYO COUNTIES—Mojave to Bishop, grading, surfacing and oiling (portions) 30 miles, \$300,000.

KERN COUNTY—Between Mojave and Ricardo, pavement of dips, \$15,000.

INYO COUNTY—Cowan's Station to Olancha, grading 17 miles, \$50,000. End of present concrete pavement to Fish Springs, grading 2.4 miles, \$7,000. Realignment, grading and surfacing $\frac{1}{2}$ mile, \$1,000. Between Lone Pine and Manzanar, grading and surfacing 8 miles, \$60,000. Olancha to Cottonwood Creek, grading and surfacing 9.4 miles, \$30,000. Cottonwood Creek to Diaz, grading and surfacing 10 miles, \$40,000. Diaz to Lone Pine, grading and surfacing 6 miles, \$36,000.

MONO COUNTY—Between Sonora Junction and Coleville, widening and realignment, \$50,000. Guard rail, 2000 feet, \$2,000. Dogtown to Point Ranch, realignment, grading and surfacing, 3.65 miles, \$20,000. Realignment at Hilton Creek 1.6 miles, \$10,000. North and south of Tioga Junction widening and surfacing 6 miles, \$40,000. McGee Creek to Convict Creek, surfacing 3 miles, \$12,000. Small bridges, \$10,000.

Valley route to point near Silver Creek.

CALAVERAS COUNTY—Widening existing underpass near Valley Springs, \$10,000.

San Bernardino to El Centro.

IMPERIAL COUNTY—Brawley to El Centro, surfacing and oiling (portions, including town of Imperial), \$50,000. Trifolium Canal to Salada Wash, widening and resurfacing 21 miles, \$353,000.

SAN BERNARDINO COUNTY—Redlands to southerly boundary, realignment, widening and resurfacing 7.2 miles, \$200,000. Mission Drain bridge, Santa Ana River bridge, San Timoto bridge, Warm Creek bridge, \$85,000.

El Centro to Yuma.

IMPERIAL COUNTY—Araz underpass, San Diego and Arizona Railroad (state's share), \$25,000.

Redding to Nevada line via Alturas.

SHASTA and MODOC COUNTIES—Redding to Alturas, grading, surfacing and oiling (portions), \$250,000.

Red Bluff to Nevada line near Purdy.

TEHAMA, PLUMAS and LASSEN COUNTIES—Red Bluff to Susanville, grading, surfacing and oiling (portions, cooperative project), \$250,000.

PLUMAS COUNTY—Bailey and Rock Creek bridges, \$25,000.

LASSEN COUNTY—Grade separation between Susanville and Purdy (state's share), \$25,000.

San Bernardino to Nevada line near Jean.

SAN BERNARDINO COUNTY—Daggett to Jean, grading, surfacing and oiling (portions) 30 miles, \$300,000. Daggett to state line near Jean (Nevada), realignment, grading and surfacing, \$50,000.

Califa to Gilroy (Pacheco Pass).

MERCED COUNTY—Ten miles east of Los Banos to easterly boundary, crushed rock shoulders, 9.8 miles, \$30,000.

Valley route near Bakersfield to Paso Robles (Cholame Pass).

KERN COUNTY—Wasco to Route 4 (Valley route), grading, surfacing, oiling and structures, 9 miles, \$150,000.

CHOLAME PASS—Realignment, surfacing, oiling (portions), \$200,000.

Valley route near Arno to Pickett's Junction.

AMADOR COUNTY—Jackson to Pine Grove, realignment, grading and surfacing 3 miles, \$9,500. Widening underpass east of Ione, \$5,000.

Auburn to Nevada line near Verdi.

PLACER AND NEVADA COUNTIES—Cisco to Soda Springs, grading, surfacing, oiling, structures (portions), 10.65 miles, \$350,000.

PLACER COUNTY—Six railroad separations and approaches (state's share), \$250,000.

NEVADA COUNTY—Donner Monument to Tahoe Junction, grading, surfacing, oiling, \$25,000.

Meyers to Nevada line via Truckee River.

PLACER COUNTY—Truckee River bridge and approaches, \$20,000.

EL DORADO and PLACER COUNTIES—Emerald Bay to Tahoe City, realignment, grading, surfacing, \$175,000.

San Bernardino, end of county pavement, to Bear Lake.

SAN BERNARDINO COUNTY—Crest Route, grading and surfacing (cooperative project), \$500,000. Crest Drive, grading, \$150,000.

Willows to highway near Biggs (Oroville-Willows lateral).

BUTTE and GLENN COUNTIES—Butte City to Biggs, grading and surfacing 7 miles, \$70,000.

Orland to Chico.

GLENN COUNTY—Hamilton City bridge approaches, surfacing and oiling (portions), \$50,000.

McDonald to Navarro.

MENDOCINO COUNTY—Bridges and approaches, \$60,000.

San Francisco to point near Glennwood (Skyline Boulevard).

SAN MATEO COUNTY—La Honda road to Saratoga Gap, grading, surfacing and oiling (portions), 7.5 miles, \$300,000.

December Record of Bids and Awards

DIVISION OF ARCHITECTURE

MENDOCINO STATE HOSPITAL—Plumbing and electrical work on attendants' building and garages. Bids opened Dec. 13th as follows: E. H. Grogan Co., Stockton, \$12,582; Latourrette-Fical Co., Sacramento, \$13,637; Luppen & Hawley, Sacramento, \$14,352; E. L. Gnekow, Stockton, \$14,599. Contract awarded to E. H. Grogan Co., Stockton, \$12,582.

General work on attendants' building and garages. Bids opened Dec. 13th as follows: Carl N. Swenson, San Jose, \$51,746; William Martin, San Francisco, \$53,248; J. A. Bryant, San Francisco, \$54,217; Lamb & Bobick, Sacramento, \$54,270; Monson Bros., San Francisco, \$54,740; J. F. Shepherd, Stockton, \$55,337; J. S. Hannah, San Francisco, \$55,772; A. M. Hildebrandt, Santa Rosa, \$56,650; Peter Sorensen, San Francisco, \$56,983; Fred J. Maurer & Sons, Eureka, \$57,787; Mahony Bros., San Francisco, \$58,044; J. P. Brennan, Redding, \$58,250; Mathews Construction Co., Sacramento, \$59,573; Fredrickson & Watson, Oakland, \$60,427; Campbell Construction Co., Sacramento, \$61,536; R. S. K. MacMillen, San Francisco, \$61,911; Joe Piasecki, San Francisco, \$62,463; M. B. McGowan, San Francisco, \$68,846; Leibert & Trobock, San Francisco, \$69,443. Contract awarded to Carl N. Swenson, San Jose, \$51,746.

MAIN STATE BUILDING (San Jose)—Repairs to roof on main building. Bids opened Dec. 16th as follows: W. J. Porter, San Jose, \$1,387; Garden City Roofing Co., San Jose, \$1,917.50. Contract awarded to W. J. Porter.

PATTON STATE HOSPITAL—White tile and marble work in wards "C" and "D." Bids opened Dec. 16th as follows: H. P. Fischer Tile and Marble Co., Sacramento, \$1,136; Charles E. Clifford Co., Los Angeles, \$1,230; Averville Tile & Mantle Co., San Bernardino, \$1,410; Ben K. Rose, Los Angeles, \$1,437. Contract awarded to H. P. Fischer Tile and Marble Co.

PACIFIC COLONY (Spadra)—Refrigeration plant and equipment. Bids opened Dec. 20th as follows:

Creamery Package Mfg. Co., \$4,170; Refrigeration & Mech. Equipment Corporation, \$5,128; York Ice Machinery Corp., \$5,195; Western Refrigeration Co., \$5,285; Vulcan Iron Works, \$5,454; Cyclops Iron Works, \$5,550; Baker Ice Machine Co., \$6,156; Jensen Creamery Machinery Co., Los Angeles, \$6,564. Contract awarded to Creamery Package Mfg. Co., \$4,170.

STATE LIBRARY AND COURTS BUILDING—Furnishings and technical equipment. Bids opened Oct. 7, 1927. Recommendation and award of contract follows: Furnishing and installing 27 of the total of 199 items required, be awarded to the Purnell Stationery Company at this company's figures totaling \$11,535.75, the corresponding figures of McKee and Wentworth totaling \$14,105; and for furnishing and installing the remaining 172 items required be awarded to McKee and Wentworth at figures totaling \$56,577.50, the corresponding figures of the Purnell Stationery Company totaling \$58,381.38. Of the original 214 items called for 15 are omitted entirely.

DIVISION OF HIGHWAYS

AMADOR COUNTY—Grading, beginning at a point 3 miles east of Jackson and extending for 0.9 mile easterly. Dist. X, Rt. 34, Sec. C. Engineer's estimate \$11,653.93. Bids opened Dec. 29th as follows: Young Bros., Berkeley, \$15,438.16; Geo. E. Finnell, Sacramento, \$12,939.66; C. T. Malcom, Walnut Creek, \$13,531.18; J. R. Reeves, Sacramento, \$16,259.50; G. D. Contoules, San Francisco, \$11,857.76; Mankel & Storing, Sacramento, \$16,438.18; P. Montague, San Francisco, \$12,321.98; M. J. Beranda, Stockton, \$17,325.68; Guerin & Ritter, San Francisco, \$14,106.95; A. J. & J. L. Fairbanks, Inc., South San Francisco, \$12,648.44; Nate Lovelace, Oakland, \$13,072.73; A. A. & H. A. Tieslau, Berkeley, \$18,720.06; J. F. Collins, Stockton, \$15,781; C. E. Murray, Modesto, \$14,455.83; C. W. Wood, Manteca, \$16,604.04. Award of contract pending.

CONTRA COSTA COUNTY—Between Richmond and San Pablo, grading and standard road surfacing approaches to Wildcat Creek bridge (0.25 mi.). Dist. IV, Rt. 14, Sec. A. Engineer's estimate \$7,431.80. Bids opened Dec. 6th as follows: John A. Casson, Hayward, \$7,825; C. W. Wood, Manteca, \$7,193; Lee J. Immel, Berkeley, \$6,923; Tieslau Bros., Berkeley, \$6,398. Contract awarded to Tieslau Bros.

LOS ANGELES COUNTY—Installation of pipe line, 21.4 miles long, between Nicholas Creek and Los Angeles, Dist. VII, Rt. 60, Sec. A-B. Engineer's estimate \$27,668. Bids open Dec. 5th as follows: P. L. Burr Co., San Francisco, \$42,529.15; Sidney Smith, Los Angeles, \$47,075; Kelley Pipe and Machinery Co., Los Angeles, \$34,523.25; Santa Fe Pipe and Supply Co., Los Angeles, \$31,537.25. Contract awarded to Santa Fe Pipe and Supply Co., Los Angeles, \$31,537.25.

MARIN COUNTY—Between Ross and Larkspur, asphaltic concrete base and surface and rock borders, 0.7 miles. Dist. IV, Rt. 1, Sec. B. Engineer's estimate \$12,872. Bids opened Dec. 6th as follows: Pacific States Construction Co., San Francisco, \$14,179; Albert G. Raisch, San Francisco, \$14,362. Contract awarded to Pacific States Construction Co., San Francisco, \$14,179.

MERCED COUNTY—Widening eight bridges south of Merced, to 30-foot roadway. Dist. VI, Rt.

4, Sec. A. Engineer's estimate \$26,149.25. Bids opened Dec. 12th as follows: Holdener Construction Co., Sacramento, \$29,374; Lee J. Immel, Berkeley, \$24,660.30; Otto Parlier, Tulare, \$23,102.50; John P. Williams, Fresno, \$30,434.95; Noble Bros., San Jose, \$28,489; Geo. J. Ulrich Construction Co., Modesto, \$29,266.50; H. C. Whitty, Sanger, \$22,171. Contract awarded to H. C. Whitty.

PLACER COUNTY—Two undergrade crossings under S. P. R. R. near Applegate. Dist. III, Rt. 37, Sec. A-B. Engineer's estimate, \$55,932.28. Bids opened Dec. 5th as follows: W. A. Bechtel Co., San Francisco, \$43,209.15; Frederickson & Watson Construction Co., Oakland, \$47,975.95; H. C. Whitty, Sanger, \$59,652.15; Otto Parlier, Tulare, \$46,984.10; Sacramento Contract Co., Sacramento, \$46,011.25; Mathews Construction Co., Sacramento, \$53,414.50; C. W. Wood, Manteca, \$49,196.90; City Improvement Co., Los Angeles, \$56,186.40; Holdener Construction Co., Sacramento, \$46,528.65; Tieslau Bros., Berkeley, \$47,653.95; E. B. Skeels, Roseville, \$59,899.60; Noble Bros., San Jose, \$43,819.95. Contract awarded to W. A. Bechtel Co., San Francisco, \$43,209.15.

SAN JOAQUIN COUNTY—Removal of old Mossdale bridge. Dist. X, Rt. 5, Sec. B. Engineer's estimate \$4,000. Bids opened Dec. 6th as follows: Holdener Construction Co., \$5,200; Geo. A. Renner, \$3,300; M. B. McGowan, \$4,970; Olympian Dredging Co., \$14,850. Contract awarded to Geo. A. Renner, \$3,300.

SONOMA COUNTY—Between Fairville and Vineburg Junction, grading and standard road surfacing approaches to Sonoma Creek bridge (0.7 mi.). Dist. IV, Rt. B, Sec. A and B. Engineer's estimate \$14,898.50. Bids opened Dec. 6th as follows: Tieslau Bros., Berkeley, \$16,047.30; P. Montague, San Francisco, \$17,697; Guerin Bros., San Francisco, \$16,862; Chas. N. Chittenden, Napa, \$15,320.75; J. P. Holland, Inc., San Francisco, \$18,403.50; Chas. Harlowe Jr., Oakland, \$18,475; C. W. Wood, Manteca, \$17,452.50. All bids rejected.

STANISLAUS COUNTY—Widening six bridges, and extending six siphons and one culvert, at points between Turlock and northerly boundary. Dist. X, Rt. 4, Sec. A. Engineer's estimate \$19,760. Bids opened Dec. 19th as follows: Holdener Construction Co., \$18,262.20; E. W. Peterson, San Francisco, \$16,675.75; C. W. Wood, Manteca, \$18,533.60; George J. Ulrich Construction Co., Modesto, \$17,113.75; Guerin Bros., San Francisco, \$16,446; Noble Bros., San Jose, \$18,362.30; Otto Parlier, Tulare, \$16,269; Lee J. Immel, Berkeley, \$15,479. Contract awarded to Lee J. Immel.

TEHAMA COUNTY—For constructing a portion of the state highway east of Red Bluff. Dist. II, Rt. 29, Sec. A. Engineer's estimate \$10,900. Bids opened Dec. 5th as follows: E. B. Bishop, Sacramento, \$10,297.50; C. W. Wood, Manteca, \$14,935; Kaiser Paving Co., Oakland, \$15,352; Hemstreet & Bell, Marysville, \$16,040. Contract awarded to E. B. Bishop, Sacramento, \$10,297.50.

VENTURA COUNTY—Surfacing 11.8 miles with crushed gravel or stone (oil treated) between Little Sycamore Creek and Latigo Creek. Dist. VII, Rt. 60, Sec. A-B. Engineer's estimate \$181,800. Bids opened Dec. 5th as follows: Tieslau Bros., Berkeley, \$192,900; George Herz and Co., San Bernardino, \$149,600; Southwest Paving Co., Los Angeles, \$143,930; Nightbert and Carnahan, Bakersfield, \$148,500; Jahn and Bressi, Los Angeles, \$156,500; Ed Johnson and Sons, Los Angeles, \$171,420. Contract awarded to Southwest Paving Co., Los Angeles, \$143,390.

WATER PERMITS AND APPLICATIONS

Permits

Permits to appropriate water issued by the Department of Public Works, Division of Water Rights, during the month of December, 1927.

MONO COUNTY—Permit 2929, Application 5514; issued to The Seymour Finance Corp., care of James H. Van Law, attorney, National City Bank Bldg., Los Angeles, December 6, 1927, for 0.1 cubic foot per second from two springs in section 14, T. 2 S., R. 26 E., for domestic use on 800 lots and hotel in section 14. Estimated cost \$1,500.

PLUMAS COUNTY—Permit 2930, Application 5166; issued to W. F. Drew, Blairsden, December 7, 1927, for 1.5 c.f.s. from Little Grey Eagle Creek in section 7, T. 21 N., R. 12 E., for power purposes. 12 t.h.p. to be developed. Estimated cost \$500.

SUTTER COUNTY—Permit 2931, Application 5696; issued to Commercial Investment Co., Sacramento, December 7, 1927, for 1.11 c.f.s. from Sacramento River in section 22, T. 12 N., R. 2 E., for irrigation of 89.21 acres. Estimated cost \$5,600.

SAN DIEGO COUNTY—Permit 2932, Application 5663; issued to Fred Lazz, San Diego, December 13, 1927, for 0.3 c.f.s. from Tubhead Spring Creek in section 24, T. 11 S., R. 5 E., for domestic and irrigation purposes on 100 acres. Estimated cost \$1,500.

SIERRA COUNTY—Permit 2933, Application 5552; issued to Chas. E. Herron, Los Angeles, December 19, 1927, for 100 c.f.s. from South Fork of North Fork Yuba River in section 31, T. 20 N., R. 11 E., for mining purposes. Estimated cost \$70,000.

SAN JOAQUIN COUNTY—Permit 2934, Application 5712; issued to Richard and Nellie C. Stevens, Ripon, December 19, 1927, for 1.25 c.f.s. from Lone Tree Creek in section 24, T. 1 S., R. 7 E., for irrigation of 100 acres. Estimated cost \$1,000.

NEVADA COUNTY—Permit 2935, Application 4309; issued to Nevada Irrigation District, Grass Valley, December 22, 1927, for 135 c.f.s. from South Fork Yuba River, Middle Fork Yuba River and Canyon Creek in sections 20 and 21, T. 17 N., R. 12 E., for power purposes. 40.883 t.h.p. to be developed. Estimated cost \$8,165,000. Permit 2936, Application 4310; issued to Nevada Irrigation District, Grass Valley, December 22, 1927, for 126 c.f.s. from South Fork Yuba River, Middle Fork Yuba River and Canyon Creek in sections 20 and 21, T. 17 N., R. 12 E., for power purposes. 16,852 t.h.p. to be developed.

SAN JOAQUIN COUNTY—Permit 2937, Application 5316; issued to McMullin Reclamation District, No. 2075, care of Harmon S. Bonte, San Francisco, December 22, 1927, for 48.75 c.f.s. from Stanislaus River in section 9, T. 3 S., R. 7 E., for irrigation of 3900 acres. Permit 2938, Application 5718; issued to Western Pacific Railroad Co., San Francisco, December 23, 1927, for 0.023 c.f.s. from Potato Slough in section 13, T. 3 N., R. 4 E., for railroad purposes in section 13.

LOS ANGELES COUNTY—Permit 2939, Application 5178; issued to U. S. Forest Service, Los Angeles, December 29, 1927, for 0.1 c.f.s. from Vasquez Creek in section 11, T. 2 N., R. 13 W., for irrigation of 25 acres. Estimated cost \$2,000. Permit 2940, Application 5301; issued to U. S. Forest Service, Los Angeles, December 29, 1927, for 0.25 c.f.s. from two branches of Clear Creek in section

S. T. 2 N., R. 12 W., for agricultural purposes on 40 acres. Estimated cost \$1,000.

INYO COUNTY—Permit 2941, Application 5478; issued to A. M. Johnson, care of E. S. Giles, Goldfield, Nevada, December 30, 1927, for 1 c.f.s. from Grapevine Canyon Spring in section 31, T. 10 S., R. 43 E., for power and domestic purposes. 28 t.h.p. to be developed. Estimated cost \$10,000.

PLACER COUNTY—Permit 2942, Application 5620; issued to Black Hawk Mine, care of L. C. Anderson, attorney, Roseville, December 31, 1927, for 2.5 c.f.s. from unnamed creek in section 4, T. 15 N., R. 11 E., for mining and domestic purposes. Estimated cost \$200.

Applications

Applications for permit to appropriate water filed with the State Department of Public Works, Division of Water Rights, during the month of December, 1927.

SAN DIEGO COUNTY—Application 5767; G. M. Jones, trustee, care of D. M. Baker, Los Angeles, for 10,000 acre-feet per annum from Coyote Creek tributary to Salton Sink, to be diverted in section 4, T. 10 S., R. 6 E., for domestic and irrigation purposes on 51,200 acres in Borega Valley.

PLUMAS COUNTY—Application 5768; Geo. P. Holman et al., San Jose, for 3 c.f.s. from Willow Creek tributary to Middle Fork Feather River, to be diverted in section 8, T. 23 N., R. 10 E., M. D. M., for mining purposes.

MADERA COUNTY—Application 5769; J. H. Wooden and J. R. Bawler, care of Everts, Ewing, Wild & Everts, attorneys, Fresno, for 2 c.f.s. and 200 acre-feet per annum from Jackass Lakes tributary to San Joaquin River, to be diverted in section 2, T. 5 S., R. 24 E., M. D. M., for power purposes at stamp mill for crushing gold ore. Estimated cost \$500.

TRINITY COUNTY—Application 5770; M. A. Senger, Weaverville, for 3 c.f.s. from North Fork Trinity River tributary to Trinity River, to be diverted in section 24, T. 35 N., R. 12 W., M. D. M., for power purposes. 375 t.h.p. to be developed. Application 5771; M. A. Senger, Weaverville, for 40 c.f.s. from North Fork Gulch, Baxter Gulch, Rapid Gulch, Thurston Gulch and Brown Gulch tributary to North Fork Trinity River, to be diverted in sections 1 and 24, T. 34 N., R. 12 W., section 36, T. 35 N., R. 12 W., section 30, T. 35 N., R. 11 W., M. D. M., for mining purposes. Estimated cost \$500. Application 5780; Robert L. Little and Geo. E. Waggoner, care of W. D. Ball, Los Angeles, for 25 c.f.s. from Stony Creek tributary to Stuarts Fork, to be diverted in section 23, T. 35 N., R. 9 W., M. D. M., for power purposes. 1400 t.h.p. to be developed. Application 5779; Robert L. Little and Geo. E. Waggoner, care of W. D. Ball, Los Angeles, for 75 c.f.s. and 10,000 acre-feet per annum from Stuarts Fork and Deer Creek tributary to Trinity River, to be diverted in section 3, T. 36 N., R. 10 W., and sections 19, 20, 31, T. 36 N., R. 9 W., for power purposes. 20,000 t.h.p. to be developed.

SAN BERNARDINO COUNTY—Application 5775; Henry F. Scholing, San Bernardino, for 0.24 c.f.s. from Sweetwater Canyon tributary to Devils Canyon, to be diverted in section 5, T. 1 N., R. 4 W., S. B. M., for irrigation purposes on 70 acres. Estimated cost \$55. Application 5781; Alice C. McRey-

nolds, care of Chapman & Chapman, attorneys, Los Angeles, for 0.001 c.f.s. from small unnamed stream sometimes known as Red Arrow Canyon tributary to Big Bear Lake, to be diverted in section 22, T. 2 N., R. 1 W., S. B. M., for domestic purposes. Estimated cost \$500.

EL DORADO COUNTY—Application 5782; Parrall Gold Mines Corp., Placerville, for 7.5 c.f.s. from Camp Creek tributary to Cosumnes River, to be diverted in section 15, T. 10 N., R. 13 E., M. D. M., for power purposes. 134 t.h.p. to be developed.

VENTURA COUNTY—Application 5783; Mrs. Glendora G. Reyes, Scheideck, for 0.35 c.f.s. from Alimio Creek tributary to Cuyama River, to be diverted in section 28, T. 7 N., R. 23 W., S. B. M., for agricultural purposes on 40 acres. Estimated cost \$35.

SANTA CRUZ COUNTY—Application 5784; The Paradise Park Masonic Club, care of Collins & Roan, attorneys, Oakland, for 0.5 c.f.s. from Eagle Creek tributary to San Lorenzo River, to be diverted in section 35, T. 10 S., R. 2 W., M. D. M., for domestic purposes. Estimated cost \$10,000.

FRESNO COUNTY—Application 5785; Miller & Lux, Inc., San Francisco, for 300 c.f.s. from San Joaquin River, to be diverted in section 30, T. 13 S., R. 15 E., M. D. M., for irrigation purposes on 54,000 acres. Estimated cost \$510,000. Application 5787; Miller & Lux, Inc., San Francisco, for 572 c.f.s. from San Joaquin River, to be diverted in section 12, T. 11 S., R. 13 E., M. D. M., for irrigation purposes on 45,745 acres. Estimated cost \$203,000.

MADERA COUNTY—Application 5786; Miller & Lux, Inc., San Francisco, for 206 c.f.s. from San Joaquin River, to be diverted in section 25, T. 13 S., R. 15 E., M. D. M., for irrigation purposes on 16,516 acres. Estimated cost \$75,000.

MONO COUNTY—Application 5776; Roy Booth, forest supervisor, agent for Crystal Crag Water and Development Association (proposed), Bishop, for 0.016 c.f.s. from Cold Water Creek tributary to Lake Mary and Mammoth Creek, to be diverted in section 21, T. 4 S., R. 27 E., M. D. M., for domestic purposes at Crystal Crag Lodge and the Lake Mary tract of summer home sites, Lots 1 to 26, inclusive. Estimated cost \$3,000.

SISKIYOU COUNTY—Application 5777; Daf-fodil Mining Company, Roseburg, Oregon, for 20 c.f.s. from Elliot Creek tributary to Applegate River, to be diverted in section 19, T. 48 N., R. 10 W., M. D. M., for mining purposes. Estimated cost \$2,500. Application 5778; Philip Philipe, Yreka, for 1 c.f.s. from Caesar Gulch tributary to Humbug Creek, to be diverted in section 6, T. 45 N., R. 7 W., for mining purposes in section 32. Estimated cost \$200.

AMADOR COUNTY—Application 5772; M. J. Pierre and Alice Plasse, Jackson, for 0.077 c.f.s. from unnamed springs tributary to west branch of west branch to south inlet of Silver Lake, to be diverted in section 17, T. 9 N., R. 17 E., section 18, T. 9 N., R. 17 E., for power purposes. Estimated cost \$1,000.

MODOC COUNTY—Application 5773; John P. Booth, San Jose, for 30 c.f.s. and 2450 acre-feet per annum from South Fork Pit River tributary to Pit River, to be diverted in section 10, T. 39 N., R. 14 E., M. D. M., for power purposes. 2036 t.h.p. to be developed. Application 5774; John P. Booth, San Jose, for 13 c.f.s. and 2450 acre-feet per annum from Mill Creek tributary to South Fork Pit River, to be diverted in section 28, T. 40 N., R. 15 E., M. D. M., for power purposes. 1216 t.h.p. to be developed.

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BUILDERS THAT THOSE WHO COME MAY PASS IN SAFETY



Harlan D. Miller bridge on the Pacific Highway in Shasta County.

AN old man traveling a lone highway,
Came at the evening cold and gray,
To a chasm deep and wide.
The old man crossed in a twilight dim,
For the sullen stream held no fear for him,
But he turned when he reached the other side,
And builded a bridge to span the tide.



“OLD man,” cried a fellow pilgrim near,
“You are wasting your strength with
your building here,
Your journey will end with the ending day
And you never again will pass this way.
You have crossed the chasm deep and wide,
Why build a bridge at eventide?”

AND the Builder raised his old gray head,
“Good friend, on the path I have come,”
he said,
“There followeth after me today
A youth, whose feet will pass this way,
This stream, which has been naught to me,
To that fair-haired boy, may a pitfall be.
He, too, must cross in the twilight dim.
Good friend, I am building this bridge for
him.”

—Anonymous.

The Harlan D. Miller bridge on the Pacific Highway about forty miles north of Redding was opened to traffic on December 4, 1927. Mr. Miller, who was chief bridge engineer for the California Highway Commission, died on October 19, 1926. A few days before his death the California Highway Commission designated the structure as the Harlan D. Miller bridge in recognition of his service to the state.

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1928



The Sacramento River at Sacramento

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Ruts Can Not Hold California

By M. B. HARRIS, Member of the California Highway Commission.

CALIFORNIA has about 6500 miles of State Highway in a more or less finished, or unfinished, condition. That is farther than from San Francisco to New York City and back again. It has about 70,000 miles of county and city highways, also in a more or less finished condition.



M. B. HARRIS.

Altogether it has over 75,000 miles of roadway, some of which is traversable with patience, and some of which is as good highway as can be found anywhere in the world. Our whole road system would reach around the earth at the equator three times, with something over. At the rate of three hundred miles a day, it would take two hundred and fifty days to go over it all. But more than half of this mileage is yet to be properly

constructed, and from ten to fifteen years will be required for that purpose.

REAL ROADS RATHER THAN PAPER ROADS

Sense and conscience both demand the completion of these roads before new ones are added; and especially so when one realizes that perfecting existing roads shortens distances and contributes to convenience much more effectively than do new roads on paper.

And as to adding to our revenue for road building by bond issues or other de-

vices: Away with the thought! We have enough, but not too much, revenue now. What we have can be used to good purpose and economically. Let us have no orgy of road building.

PIONEER DEVELOPMENT

The pioneers in the development of our road system planned and built even better than they knew. One must travel by auto for weeks over this state to realize what it meant to plan a system of roads that should respond at all adequately to the longitude, latitude and altitude of this unique state, and at the same time accommodate itself to traffic conditions as they were and as they would probably develop. But they did it. And what is more, they experimented with sound judgment and clear insight in the matter of road construction, with all that means under the varying conditions of soil, climate, moisture and heat of a state that runs the gamut from tropical to boreal, and from desert to swamp.

They have contributed an admirable road plan and an experiment in road building which, augmented by that of road builders everywhere, should result in the construction of the very best roads to be found anywhere in the world. And that is exactly what is now being done. These roads have been planned so that it is easy to enter the state from

both north and east, and so that whether it be commerce, scenery or climate one seeks, there is an easy way to it, or will be when these roads are completed. There is to be a uniform construction and improvement of roads throughout the state so that each part of the state shall have its just proportion.

CALIFORNIA IS UNIQUE

California is unique physically, climatically, geographically and historically. The

In this article former State Senator M. B. Harris of Fresno tells of the relationship of California to world development and of the part that highways are playing and will play in making California the center of "commerce, and wealth, art, literature, culture and a civilization such as the world has never before known." Senator Harris points out that California's road system, including state and county highways, would reach around the earth at the equator three times and would take 250 days to travel its length at the rate of 300 miles a day. He urges the completion of the present roads before new highways are admitted into the state system but warns against any "orgy of road building." He also pleads for the preservation of the recreational areas of California, declaring that "our children will see a population in California so great that the thought of it appalls a lover of the great waste places and solitary mountain trails." Again Senator Harris says: "Undoubtedly there is a correspondence between visible things and human thought. Men think, act and live to some extent in harmony with the things they see."

white man, trekking west from somewhere in Asia, has reached the end of the trail in California. Three hundred years ago (four long lives span it) he settled the Atlantic Coast of this continent. One hundred fifty years ago (two long lives span it) he introduced the United States into the family of nations. At that time the United States was a narrow strip along the Atlantic and had a population of about 3,500,000, or less than California has now. Today the continent is settled from Atlantic to Pacific. The 3,500,000 has become 110,000,000. This coast, the last to be reached, has just begun to develop. Seventy-five years ago (one long life spans it) California was admitted to statehood with a population of 93,000. Whether we like it or not, the millions are on their way, and will soon be here. Our children will see a population so great that the thought of it appalls a lover of the great waste spaces and solitary mountain trails.

California has an area equal to that of the states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York and Pennsylvania, and natural resources and trading opportunities even greater. Its population is about five million. Theirs is more than thirty million.

SAVE THE RECREATIONAL AREAS

Thinking of thirty million people may suggest corner lots, but I am thinking of our beaches, the longest and most beautiful in the world; of our forests, unrivalled in the size and majesty of their trees; of our many natural parks, so much more desirable than man-made parks. Somehow, some of these at least, must be preserved in their beauty, and reserved for the use of the public. It is quite true that Jones, who owns the land, does not own the landscape, and that the beauty of it is for him who looks upon it. But Jones can devastate the beauty of the forests and fence the beach, or worse still, cover it with oil derricks.

California has all of the beauty and grandeur and variety of scenery of Greece, Italy and Switzerland. Undoubtedly, there is a correspondence between these visible things and human thought; there is a relation between mind and matter. Men think, act and live to some extent in harmony with the things they see.

Here, too, we have all the varieties of climate found in old world lands where the highest civilization has been developed. There is no climate about the Mediterranean, that birthplace of civilization, but has its counterpart here; and so has almost every other cli-

mate, for that matter, that can be found anywhere in the world. And there is a close relation between climate and civilization.

NO RUTS IN CALIFORNIA

There are no ruts in California, either in the roads or in our customs. We are new, very new. The habits and prejudices of the past (for there is no past here) do not forbid the installing of bathtubs in our houses, nor sewer systems in our cities.

Here we are developing an educational system, from kindergarten to university, which should be distinctive and individual, and will become so when we renounce the idea that scholastic institutions are measured by their registration.

THE OPPORTUNITY THAT IS OURS

What an opportunity! Here at the end of the white man's trail, in a new land, with all history to guide us, with no ruts to hold us, with all the favorable conditions of climate and land that produced the greatest civilizations of history, with transportation possibilities that annihilate distance, and give the experiences and contacts that prevent provincialism, here we should develop not only commerce and wealth, but an art, a literature, a culture and a civilization such as the world has never before known.

Wednesday has been selected by the State Department of Public Works as a uniform week day for the opening of bids on construction work. The selection was made by B. B. Meek, Director of the Department, at the request of the contractors of the state. It was stated by the latter that Monday, the day upon which bids have previously been opened, worked a hardship upon contractors in that it conflicted with county and city bid openings. It was also urged by contractors that it was sometimes difficult for them to make the required banking arrangements at the end of the week in readiness for Monday and on that account added several days bank interest.

The difficulty of securing material quotations at the end of the week was also given as a reason for making the change.

The construction of an elaborate system of super-highways, greatly enlarging the federal-aid highway program, which provides for 182,000 miles of federal-aid road, has been asked in a bill just introduced in congress by Senator George H. Moses of New Hampshire. The measure, actively supported by the American Motorists Association, provides for a highway as direct as practicable between the Atlantic and Pacific coasts and for cross highways, which would connect the entire United States.

The Six Legged Tetrahedron

Not a Prehistoric Animal, But an Effective Protector of Highways

This article, with photographs, covers a recently completed river bank protection job by the state in Ventura County. The type of protection work is very unique and has proved very successful.

By E. T. SCOTT, Assistant District Maintenance Engineer.

If the Santa Clara River were allowed to choose its own course, it would flow some place other than under the present 2077-foot state highway bridge near Montalvo, on the Los Angeles-Ventura Highway. On several occasions during the last few years the river, swollen by flood waters, has swung sharply to the west, cutting away the 15-foot embankment on that side of the river, and destroying several acres of agricultural land.

During the storm of February, 1927, the river took another swing to the west at a point about 1200 feet upstream from the state highway bridge and continued to wash away the high river bank until it threatened to cut through the west approach to the bridge. Only the vigorous action on the part of the maintenance organization, the crew working night and day, prevented the highway from being washed out.

TETRAHEDRON ANSWER TO PROBLEM

The trees, cable and brush used successfully by the maintenance crew during the storm, in preventing the flood waters from cutting through the highway, offered but a scant barrier to further inroads from the stream during floods of the winters to follow. Studies were made to determine the best means of bank protection for the particular case. An inspection made of various types of bank protection work used in the Santa Clara River showed that the only type of permanent bank protection that had successfully withstood the floods was the concrete skeleton tetrahedron.

The accompanying pictures show an effective method of highway protection against flood that has been adopted on the Santa Clara River in Ventura County. The upper picture shows the damage done by high water eating into the bank, beneath it is a picture showing how a tetrahedron is anchored. Next below it, is a picture of a view of a line of tetrahedrons in place. The next picture shows the tetrahedron tilted by flood water but still in place. The lower picture shows brush and trees growing up behind the tetrahedron and reestablishing the natural bank.



SUCCESS PROVED

The use of concrete skeleton tetrahedrons to control the river was first employed by Dan Sheldon who has owned and operated for many years a 400-acre ranch immediately north of the state highway and located along the west bank of the river. Beginning back in 1912 Mr. Sheldon invented and constructed and placed at strategic points along the river, concrete tetrahedrons which have been most successful in controlling the flood waters of the Santa Clara River.

Standing thirteen feet high, composed of six 16-foot legs a foot square, well reinforced with steel, and weighing about seven tons each, the concrete tetrahedrons are capable of withstanding a tremendous force.

Should the tetrahedron be undermined or even toppled over by the flood, it still stands on a broad base always offering resistance to the on-rushing water. Several years ago one of the 7-ton tetrahedrons standing at the end of a row, and not cabled to the adjoining tetrahedrons, was washed a quarter of a mile down stream by the flood. It took hours for the heavy concrete figure to cover the quarter mile and each time it rolled to a new one of its four similar bases, it stood upright, always resisting the force of the river. After the storm the strayed tetrahedron was dragged back to its place with a tractor, having suffered no damage during the trip.

MAKES ITS OWN BARRIER

A large amount of driftwood and brush is carried by the Santa Clara River during flood times. Soon the drift begins to accumulate against the row of concrete tetrahedrons laced together with cables. As the tangle of brush increases, the swift current of the river is halted a little and the silt and sand carried by the water begins to drop and accumulate both upstream and downstream from the obstruction, and the river veers back to its old channel. In a very short time the row of tetrahedrons stops the flood with a wall of brush and sand that the river itself has built.

DETAILS OF JOB

In order to adequately protect the highway embankment and force the river over toward its old channel, a row of thirty concrete skeleton tetrahedrons placed approximately nineteen feet apart from the center of one to the center of the adjoining one, was constructed along the west bank of the river on the upstream side of the bridge.

The row of tetrahedrons, nearly six hundred feet in length, was constructed from the river bank at an angle swinging downstream, and

completely crossing the newly cut low water channel of the river.

During the construction of the straight row of the thirty tetrahedrons, ranchers owning property along the east bank of the river, over 2000 feet away, objected to the continuation of the work as originally planned fearing that flood waters would be forced across the river to do damage to their property. In order to appease the fears of the complaining ranchers and at the same time without lessening the effectiveness of the protection work, an angle was thrown into the line and the six tetrahedrons furthest from the bank were constructed at a right angle to the direction of the bridge.

METHOD OF MAKING

The concrete skeleton tetrahedrons were made up of six legs, each 12 inches square and reinforced with eight $\frac{3}{4}$ -inch bars, the two outside corner bars of each leg being 17 feet 6 inches long, bent into and tied to the opposite corner bar of the adjacent legs, and six bars 14 feet long extending into adjacent legs, at the junction. A spiral reinforcement of a number 8 wire was wound with a 6-inch pitch, around the longitudinal reinforcing bars.

Each leg, measured from corner to corner, was 16 feet long, the height of the tetrahedron from the ground to the vertex being approximately 13 feet.

Steel reinforcement was assembled where the tetrahedron was to be constructed. Sheet iron corner forms were then slipped over the reinforcing bars at the three corners of the base and wooden forms for the legs set in place. A sheet iron corner form similar to those used on the base corners, but having a small opening at the top to admit concrete, was used at the vertex of the tetrahedron.

Concrete was poured into the lower part of the tetrahedron direct from wheelbarrows, and when it got too high for the wheelbarrows, it was shoveled into the forms, while the last few cubic feet of concrete to be placed at the top was elevated by a bucket attached to a portable swinging teeter beam.

HOW THEY WERE PLACED

The row of tetrahedrons was placed with the 16 feet sides lining up on the upstream side, with the points of the equilateral bases downstream. A space of three feet was left between the corners of adjoining tetrahedrons on the upstream side.

Six lines of old one-inch cable, secured from nearby oil fields, were stretched along the upstream side of the tetrahedrons, with one line along the downstream side of the row. The cables were fastened in place by wrapping around the legs and by the use of cable clamps, the purpose of the cable being to tie the whole row of tetrahedrons together so that they would act as a unit during a flood, and also to catch and hold the brush and trees carried down by the storm waters.

ANCHORED TO RIVER BANK

At the bank end of the protection work, the cables were cast into a large block of concrete which anchored them at a safe point to the river bank. Some brush was piled in near the bank to prevent any possible cutting in back of the protection work.

COST OF WORK

The reinforced concrete tetrahedrons were constructed at a cost of about \$112 each, exclusive of the

(Continued on page 15.)

The Passing of "Passing-the-Buck"

By GEORGE C. MANSFIELD.

PASSING-THE-BUCK is fast becoming a thing of the past in the conduct of California's government.

Authority—Alexander R. Heron, Director of the Department of Finance of the State of California, an expert on both state finances and state government.

Reason—The Governor's Council.

Time was when passing-the-buck and politics were considered as synonymous terms. It was the most ancient of political practices, the most venerable of political rites. It was justified on the basis of political self-preservation. The slogan was:

Safety First. Do nothing, but don't get caught at it! Pass the buck!

But when the Governor's Council came in at the door, buck passing opened a window for its exit. The fact is already recognized in Sacramento. The state is now beginning to find it out.

MR. HERON TELLS STORY

This is the way Mr. Heron told the story in a recent address to which the writer had the pleasure of listening, and which he believes may be of interest to the readers of the journal.

"The directors of the nine major state departments into which Governor Young and the legislature consolidated the one hundred and more previously existing state agencies meet together each month with Governor Young. This is known as the Governor's Council.

"They all meet in the same room at the same time.

"All of the directors are appointed by the Governor, and are responsible to him for the conduct of the departments they respectively represent.

"Many, and in fact most, of the major activities of the state require action from more than one department. Before the reorganization and coordination of the state department, when over one hundred agencies of the state functioned independently of each other, joint action was difficult of attainment. The situation encouraged buck passing. It was easier to alibi than to act.

"The Governor's Council, however, has created a condition that reverses this. The reason is plain. It is extremely difficult to pass the buck when the person to whom you

are passing it is in the same room with you and ready to pass it back.

"EASIER TO ACT THAN TO ALIBI"

"In other words it is easier now to act than it is to alibi."

Mr. Heron illustrated his point by describing a hypothetical meeting at the Governor's



ALEXANDER R. HERON.

Council, in which the following imaginary incident might have occurred:

The Director of Institutions reports that patients in a certain state hospital are sleeping on the floors and in the halls by reason of inadequate housing facilities.

The Director of Social Welfare corroborates this report, and states that this overcrowding has been noted at her last inspection of the hospital in question.

The Governor turns to the Director of Public Works, and calls attention to the fact that an appropriation was included in the budget for enlarging the accommodations at this

particular institution. It is up to the Director of Public Works to make some explanation.

The Director of Public Works states that the Director of Finance has not yet made the appropriation available for us. The Director of Finance must in his turn explain the failure of his department to function.

With all of responsible parties together in one room with the person to whom they are all responsible, situations between departments that it previously took months to unshar are untangled in a few moments.

PUTTING BUSINESS METHODS INTO GOVERNMENT

"The Governor's Council," continued Mr. Heron, "is bringing to the business of the state the same precision of procedure that a business corporation demands of its executives.

"The plan is proving as successful in practice as it was excellent in theory. In the five months that have passed since the organization of the Council, it has been very clearly shown that the percentage of uncompleted passes in state government has been very considerably reduced. This is the logical result of a system that makes it possible to readily determine where fault lies and to immediately fix responsibility."

HOW JUMBLE GREW

Of equal interest with Mr. Heron's statement of the value of the Governor's Council to the state was his explanation of how California's government grew into the jumbled mass of over-lapping and conflicting jurisdictional agents that existed before the coordination of departments took place.

Mr. Heron, in addition to the aid given Governor Young in Mellon-izing the financial affairs of the state through the institution of a complete state budget, also gave yeoman service in the difficult and involved task of helping the Governor to redepartmentalize the state government on a workable, efficient, and economical basis. He accordingly again speaks with the voice of authority.

"California's government, like all other state governments," Mr. Heron says, "was like Topsy. It just grew." He continued:

"The first function of government everywhere has been to protect life and property.

"This next expanded into the protection of certain civil and individual rights.

"These in turn gave birth to a new conception of the function of government, namely that the government should give to its citizens the opportunity for the highest development of their individual abilities.

"This latter conception of government is reflected in the free public schools and in a score or more of enlarged governmental activities.

"During the last twenty years, the same thought has found expression in laws for the regulation of housing conditions, hours of labor, rate and method of pay, child labor, sanitation, employment of immigrants, and a hundred other similar functions.

THE PRICE OF PROGRESS

"Each new service seemed to require the creation of a new governmental agency. The political thought of California has very possibly been more progressive and enlightened than elsewhere in the world. Accordingly these functions may have been added to state activities here more rapidly than elsewhere. At first there was little confusion between existing governmental agencies. But gradually the "set-up" in state affairs became more and more complicated and tangled.

"Finally, when Governor Young undertook to cut the Gordian knot, there were more than one hundred and forty state boards, commissions, and bureaus and other agencies in California, each created independent of the other, all jealous of their jurisdictional rights, all attempting to operate independently, and all more or less resentful of interference from other agencies, even where functions were allied and rights related.

"This confusion of governmental agencies was a penalty that California paid for the progressiveness of its political thought, and for rapidity in the development of a humanitarian program unequalled elsewhere in the world.

SAVING GOLD, ELIMINATING DROSS

"Governor Young's job was to save the gold of this program, and eliminate the dross. His long experience in Sacramento as assemblyman and lieutenant governor gave him an insight into conditions in the state government that a less experienced governor could only acquire after years in office. He immediately undertook two tasks, both of large proportions.

"The first of these was to give to the people of the State a complete accounting of state expenditures in advance of their actual disbursement. A real state budget, the first of its kind in the history of California, one without a deleted figure or a single activity of the state omitted, was the result. The second major undertaking was the reorganization of the state upon a business basis."

(Continued on page 19.)

Sacramento-San Joaquin Water Problems

By HARLOWE M. STAFFORD, Sacramento-San Joaquin Water Supervisor, Division of Water Rights.

APPROPRIATIVE and other vested water rights on the Sacramento River between the city of Sacramento and Red Bluff total approximately 6000 second-feet. Water requirements both for irrigation and salinity control in the great and fertile delta

of the Sacramento and San Joaquin rivers approximate 3500 second-feet or more with a much greater flow required to maintain the desired fresh water along the industrial section downstream from Antioch and Pittsburg. An estimated flow of from 3000 to 3500 second-feet in the Sacramento River above Sacramento is needed to satisfy navigation requirements. Yet there was an actual available flow in the



HARLOWE M. STAFFORD.

river at Red Bluff after July first of not more than 3500 second-feet in four of the last eight seasons and one only had more than 4500 second-feet. Similarly, there has been a summer flow of the San Joaquin River to the delta of considerably less than 1000 second feet in some of these years.

SITUATION ACUTE IN 1920

These problems are serious and are demanding the earnest thought and endeavor of the various interests involved and of the state, for an early solution. The first acute situation to arise was that in 1920. In that year, with the run-off of the San Francisco Bay drainage area only 48 per cent of normal and the largest rice planting in the Sacramento Valley in the history of the industry up to that time, the situation was saved

through the Emergency Water Conservation Conference, a voluntary organization of water users and state officials, and a Water Master appointed by the conference to regulate the Sacramento River diversions of those signing a Water Users' Agreement prepared by the conference. It was in this year, however, that, as a result of the salinity encroachment in the delta, the famous Antioch suit was instituted. This cost the valley some hundreds of thousands of dollars but did not result in a solution or even a basis for a solution of the problem.

1924 EMERGENCY

Following years of more normal stream flow in 1921, 1922 and 1923 came the extremely dry year of 1924, when the run-off of the San Francisco Bay drainage area was only 27 per cent of normal. With the probability for a critical season evident as early as January in that year, a pressure for the initiation of a definite constructive program in the solution of the problems was felt on all sides. This found expression in the first Sacramento-San Joaquin River Problems Conference, which was held in Sacramento January 25 and 26, 1924, under the auspices of the Division of Water Rights and the Sacramento Chamber of Commerce.

Through the medium of authoritative papers presented by experts this conference brought out clearly for discussion the many angles to the problems from the standpoint of the up-river water users, the delta irrigators

and the navigation, power and industrial interests.

A committee known as the Permanent Committee of the Sacramento-San Joaquin River Problems Conference was appointed to " * * * prepare a program for the coordination, adjustment, and development of all irrigation, power and navigation interests, with a view to securing the utmost conservation and use of the waters of the Sacramento and San Joaquin rivers and their tributaries for the protection and benefit of all."

There is probably no other place in the United States where a problem of the complexity and diversity of the one discussed in this article can be found uniting irrigation, flood control, navigation and the control of salinity. In most cases in arid America the only problem encountered is that of getting an adequate supply of water to the land but here we have the several other phases. It is difficult in many cases to solve the problems because of inadequacy of the supply but it is gratifying to know that it is physically possible to care for and develop all interests in the Sacramento Valley to the utmost. The engineers and the committeemen who will have charge of the supervision of this development must indeed be men of super vision.



Views along the Sacramento River—To the left, the picturesque irrigation plant of Natomas-Elk Horn Mutual Water Company on the Sacramento River, a few miles up stream from Sacramento; average capacity about 65 cubic feet per second; Middle picture, scene in the delta of the Sacramento; To the right, is a view of the Tisdale Pumping Plant of the Sutter Basin Company near Grimes. This is one of the largest irrigation plants on the Sacramento River. Its average capacity is 600 cubic feet of water per second.

Since the first conference this committee has functioned actively and has proved to be a powerful influence in welding together the divergent interests involved, in bringing about constructive cooperative effort and in preventing litigation in the face of critical situations that have arisen.

Early in 1924 the Permanent Committee, in cooperation with the Division of Water Rights, instituted a definite plan of action to carry through the irrigation season. This called for an agreement among the water users and other interests to provide for a water supervisor to be appointed by and work under the direction of the division.

In specifying the functions of such an official there were certain considerations which should be clear. Basically, it may be stated that the ultimate objective of all water legislation and administrative effort is the distribution of the water itself to those having a valid claim upon it, and where the water titles on a stream have been definitely adjudicated, experience has demonstrated that this can be readily accomplished through a State Water Master. However, as indicated in a previous article,* in striving to consummate the prerequisite clearing of water titles, three courses are open: (1) litigation, (2) the code provisions of the Water Commission Act, and (3) mutual agreement based upon investigations and determination of physical fact.

In the case of the Sacramento-San Joaquin situation, with litigation and its destructive ramifications naturally repellent, and the second course inapplicable because of the many classes of water rights under which

diversions are made, the third course becomes the one most practical and applicable. This is indicated in an analysis of the water diversions under the various classes of water rights, showing in 1926 for example:

For the Sacramento River and tributaries in the valley above Sacramento:

Old appropriative rights (initiated Prior to the Water Commission Act)	847,083 acre-feet
Appropriative rights under permit from the Division of Water Rights	721,442 acre-feet
Presumably riparian rights.....	76,447 acre-feet

For the Delta Uplands (from Lower San Joaquin River and Old River above the Delta):

Old appropriative rights.....	52,418 acre-feet
Appropriative rights under permit.....	84,619 acre-feet
Presumably riparian rights.....	9,869 acre-feet

For 265,000 acres irrigated in the Delta in 1926, a considerable portion is covered by appropriative filings before the Division and practically the entire delta area of more than 400,000 acres claims water under riparian rights.

With the facts of water supply, actual water requirements and use definitely established through engineering investigation, experience has proven it perfectly feasible to base thereon mutual agreements, either temporary to tide over an immediate crisis or more or less permanent, under which a water master or water supervisor may successfully distribute and conserve for the best interests of all a deficient water supply. The water supervisor's authority and benefits to be derived from its exercise will extend only so far as the water users' mutual agreements permit.

(Continued on page 30.)

*See November, 1927, issue of CALIFORNIA HIGHWAYS AND PUBLIC WORKS—article entitled "Putting the 'Right' into Water Rights," by Harold Conkling, Chief, Division of Water Rights.

Necessity for Adjudication of Existing Water Rights in California

By GORDON ZANDER, Hydraulic Engineer, Division of Water Rights, Department of Public Works.

THE IMPORTANT part which the water resources of California have played in development of this state to its present population of about five million people, and its present wealth as represented by a total assessed property valuation of about seven and one-half billion dollars, can hardly be overestimated.



GORDON ZANDER.

In pioneer days, when the mining industry was the chief factor which stimulated our remarkably rapid early growth, mining operations of every character were dependent upon a supply of water. The waters of our streams were used extensively for hydraulicking, sluicing, panning, stamping, etc. Later, as the more lucrative mining areas were worked out, the attention of our population was gradually diverted to the agricultural development of our great fertile valleys. The extent to which this agricultural development has now progressed is indicated by an estimate compiled by the United States Department of Agriculture, showing that the total value of all California farm products marketed in 1926 was 656 million dollars. For comparison, various sources of information indicate total values for our 1926 production in other classes of raw materials as follows: minerals (including oil), 450 million dollars; lumber, 73 million dollars; fishery products, 18 million dollars.

DRAFT ON WATER GROWS

It was early recognized that in general most crops can not be successfully and profitably grown in California without irrigation, on account of our long summer dry season: consequently our remarkable agricultural development has been accompanied by a constantly

increasing draft upon the waters of our streams for irrigation purposes. By the use of an extended curve plotted from the total irrigated areas in the state as shown by the various government censuses up to 1920, it is roughly estimated that there are at present approximately six million acres of land in the state that are under irrigation.

In more recent years hydroelectric power development, in which California has lead the entire world, has become a very important factor in the utilization of our water resources. According to information recently issued by the State Railroad Commission, hydroelectric plants having an aggregate capacity of nearly two million horsepower have already been installed in California.

And in addition to the utilization of our water resources for mining, agricultural and power purposes, there is the ever increasing demand for water for domestic use by our growing population, and for municipal and industrial uses within our rapidly expanding cities and towns. Only those in close touch with our water resources realize what a factor water is in the remarkable development that has taken place in California since it was admitted to the Union only seventy-eight years ago.

REMAINING UNAPPROPRIATED WATER RESOURCES LIMITED

Have we still unlimited unappropriated water resources for our population to draw upon for further development, in the comparatively unrestricted manner in which they



Automatic recording device on Soldier Creek, Modoc County. By means of this device a continuous record of the flow of the stream was kept during an adjudication investigation.

have been free to draw upon them in the past? The answer is clearly in the negative. This conclusion was first officially recognized by our legislature in 1913, when a complete code of water laws, known as the "Water Commission Act," was enacted. And it was again recognized by the legislature in 1921, when funds were appropriated for a comprehensive engineering study of our water resources to be made under the supervision of the State Engineer, for the purpose of formulating plans and policies under which a systematic, judicious and coordinated development of our remaining unappropriated water resources could proceed.

On many streams in the state development has already progressed to a stage where the aggregate of the quantities of water claimed



STREAM GAGING STATION ON HAT CREEK,
SHASTA COUNTY.

Records of the stream flow at this station have been kept for the past five years as a basis for an adjudication of the water rights and for subsequent administration of the stream.

by the various water users exceeds the normal water supply. On most other streams developments have already been proposed that would utilize the balance of the water supplies, as evidenced by filings with the State Division of Water Rights. Under these conditions it is clear that the public welfare demands that as further development takes place, present water users must be protected in their rights already vested, and at the same time capital invested in new projects must be assured of the water supply filed upon for such projects in so far as unappropriated waters will permit, and protected against the possibility of expensive litigation caused by exorbitant claims on the part of owners of prior rights.

PROTECTION OF WATER USERS AN IMPORTANT DUTY OF THE STATE

The protection of a party in the enjoyment of a water right which he has legally acquired is just as much a function of government as is the protection of that party in the enjoyment of any property rights that he may possess. Furthermore, as it is a generally recognized principle that the state owns its

water resources and merely allows the acquisition of rights to use the same under certain restrictions of law, it would appear that the state government is the proper agency to provide the necessary protection to water users. This duty on the part of the state has been recognized by the legislature by the inclusion in the Water Commission Act of complete provisions for the necessary machinery for state administration of our stream systems through the agency of "water masters."

ADJUDICATION NECESSARY BEFORE PROTECTION CAN BE AFFORDED

Before a stream system can be administered by the state, however, all water rights on the stream must be adjudicated in order that a definite basis for distribution may be established. In this connection it is pointed out that no definite control over the acquisition of rights by appropriation was exercised by the state prior to 1914, when the Water Commission Act went into effect; consequently most appropriative water rights initiated prior to that time are undetermined as to amount of water, and many are undetermined as to priority as well. In addition, there are the many undetermined riparian and prescriptive rights, of which in most cases there is not even any record.

COURT ADJUDICATIONS GENERALLY EXPENSIVE AND OFTEN INADEQUATE

Prior to the enactment of the Water Commission Act, an adjudication of water rights could only be accomplished through regular court procedure. Court proceedings have generally proved very expensive, however, and in many cases they have failed to bring about the desired results. Stream flow is one of the most difficult subjects of litigation because by its very nature it is extremely variant in quantity and difficult of measurement. A recent example of the extent to which water litigation can become involved occurred in the suit brought by the Santa Margarita Rancho involving water rights on the Santa Margarita River in San Diego County. Up to the present time that case has occupied 186 full court days, during which 22,000 pages of transcript have been taken, and the hearing has not yet been completed.

WATER COMMISSION ACT PROVIDES ADEQUATE ADJUDICATION PROCEDURE

With the passage of the Water Commission Act provisions were made available under which a complete adjudication of all water rights upon any stream system may be accomplished in a single proceeding, through the

(Continued on page 27.)

Caring for the Dangerous Insane

California Provides Home at Mendocino Hospital Designed for Deranged Patients of Anti-Social Delusions

By W. K. DANIELS, Deputy Chief, Division of Architecture.

AMONG the many different types of housing problems the Division of Architecture must meet and solve in connection with state institutions, one in particular stands out and requires studies involving new problems in state architectural studies.

The problem of housing and caring for the insane presents many obstacles, but the matter of housing and caring for insane of anti-social tendencies is indeed a major problem. The solution of this problem, however, is apparently near as the Division of Architecture is at the present time constructing a building at the Mendocino State Hospital which will function as a hospital for insane patients requiring special custodial care.



W. K. DANIELS.

As early as 1882 the suggestion was first made to erect a building to house what was then termed "criminal insane." The idea originated in the prisons whereby prisoners becoming insane could be properly segregated from other prisoners and be accorded medical attention of a nature the prison physicians were unable to give. After repeated requests from the Prison Board, the legislature appropriated a sum to erect such a structure and about 1905 a project was started at the Folsom State Prison. Besides costing a considerable sum of money, several years were consumed in its erection. The building as designed was of the jail type and built of granite stone quarried and prepared by the prisoners. Construction work was done by prison labor under the direction and supervision of the then State Engineer.

Construction was carried along to a point nearing completion, but when the building was about to be turned over to the prison authorities for operation, opposition arose to

this method of caring for insane persons of the type described. Objection was based on the theory that it was wrong to consider the insane of any nature as criminals. It was asserted that their care should not be connected in any way with a penitentiary. The objections prevailed, and as a result, the structure was never used for the purpose originally planned. For a time some of the cells were used for solitary confinement cases. An attempted escape resulted in a killing, and since then the building has been abandoned.

The Division of Architecture has in the past made various surveys and estimates as to ways and means to utilize the material in the structure but nothing has developed from these studies. The building stands today, outside the prison walls battling the elements, defeated in its purpose of assisting society in the burden of caring for insane persons requiring special custodial attention.

As a result of this failure the state institutions for insane were obliged to continue to care for this type of patient. They did this in the most satisfactory way possible under existing conditions. The hospitals for the insane were not controlled by armed guards as



Jail type building for the dangerous insane constructed at Folsom and later abandoned.

are the prisons, and it is not to be wondered that escapes took place.

It so happened a patient of this type escaped from one of the state hospitals on several different occasions and set fire to buildings in a nearby town. This situation brought about a protest from the community and a movement was started to remove the hazard. As a result an appropriation of \$150,000 was



Special custodial building for the anti-social insane now under construction at the Mendocino State Hospital.

approved by the 1925 legislature to erect a Special Custodial Unit to care for this type of insane.

The problem of the location of this unit was submitted to each of the state hospitals for insane for recommendations as to the site, involving as it did the housing and responsibility of the most dangerous type of person the state has to care for. To Doctor Donald R. Smith, Medical Superintendent of the Mendocino State Hospital, goes the honor of being the medical superintendent in the state service to accept this burden by voluntary offer.

Practically all of the old main buildings at the state hospitals were designed and erected on the order of jails. They had iron bars at all openings and were from three to five stories in height. In late years, however, this plan was discontinued, now buildings of domestic type, and as a rule only two stories in height, are being erected, the purpose being the reduction of the fire hazard to a minimum and the creation of a pleasing environment for the insane. By making these surroundings resemble country estates instead of jails a long step towards helping in cures was made.

The problem confronted us as to how to construct a building to meet the requirements of housing safely these insane patients of anti-social tendencies and at the same time to continue to design a building of pleasing domestic suggestions and without the appearance of a jail. With the construction of the special custodial unit at the Mendocino State Hospital, now about 50 per cent complete, evidence is given of what California is trying to do in this matter. Without doubt the building will be second to none among structures in the United States serving the same purpose. It will be the first building of its kind and character to be erected and completed in the State of California.

The nature of the insane patients to be cared for in this building is such as to require their continued

confinement there. It is accordingly necessary to care for and treat them within the buildings without transferring to other buildings for treatment or other purposes. Accordingly the building is practically a complete unit in itself.

Careful consideration in planning the arrangement inside the building was given as in all other insane hospital buildings, to reduce to a minimum the possibility of patients doing bodily harm to themselves or others. In this connection, however, the writer has been informed by Doctor Smith that this particular type of insane person is not altogether dangerous while confined. In a large percentage of cases no greater care is required than in average insane cases. Should an escape be made, however, this type of the insane becomes very dangerous. Accordingly only patients of this class are to be kept in this building. This does not mean that all these patients have at some time committed crime, or have been convicted of some crime, or have spent any portion of their time in a state penitentiary. It is true that some patients who have had anti-social records will be housed in this building, but there will be others who have not.

When such patients are received at the hospital from any source, they will be examined mentally, physically and neurologically. They will receive a course of hydrotherapeutic baths, be given some form of occupation, if possible. They will be permitted many amusements, such as books, music, games of various kinds, as well as card games, checkers, moving pictures once a week, and out-door exercise whenever the weather permits for a period of from four to six hours per day. They will be fed in the large dining room and will have the use, while in-doors, of the spacious day room.

Should any patient be found to be suffering from any definite or specific condition, this will be treated as required. These patients, of course, will have access to and care from the surgery or X-ray department should either of these measures be necessary. In other words, they will receive the same care and treatment, and be given the same opportunities for recreation and occupation, as other mentally sick persons in the hospital but, owing to their anti-social proclivities, must be kept within a building from which they can not escape.

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BERT B. MEEK.....Director
GEORGE C. MANSFIELD.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

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TOLL ROADS AND BOND ISSUES ARE DISCUSSED

Two pronouncements of policy made by B. B. Meek, State Director of Public Works, at the January meeting of the Governor's Council have been widely and favorably commented upon by the press of the state.

The first has to do with the construction of toll roads and toll bridges. Mr. Meek's statement at the Governor's Council was made in connection with a proposal to make a contribution from the Joint Highway District Fund to a road which would connect a county road at one end with a toll road on the other. Meek declared that it was his opinion that the time had passed for toll roads or bridges in California, and that the state should not participate in any road project, travel over which was not free to the public. In this view Governor Young concurred.

Mr. Meek also expressed the view that bond issues for the construction of highway projects intended to be built by the Division of Highways or for ultimate inclusion in the state road system should be discouraged. Present revenues derived from taxes on gasoline he declared both to be adequate to carry on a sufficiently comprehensive state highway program, and to represent about as large a sum as the Division of Highways could spend with proper regard to efficiency and economy in construction.

Discussing the matter of the proposed bond issue of \$10,000,000 for the elimination of grade crossings, Director Meek stated that a study of all the grade crossings the construction of which is contemplated during the present biennium is now being made with a view of reaching a financial arrangement with the railroads, by which a definite policy of allocating costs between the state and the railroads concerned would be agreed upon. Mr. Meek also stated that a study was being made to determine the extent to which grade crossings could be eliminated by realignment of the highway to avoid track crossings.

Are People Ready To Have Roads Routed Rightly? Rowell Says "No"; Examiner "Yes"

Chester Rowell has the following to say in his syndicated column:

"Will the people be willing to substitute traffic pressure for political pressure as a basis for framing road programs?" asks Governor Young. And the answer is that they certainly should, but they probably will not. The highway commission of course should, and doubtless will, base its program on traffic pressure. But it need have no illusions that it will not have to resist political pressure. The purpose of roads, from the standpoint of the commission, is to carry the people where they want to go; but the purpose, from the standpoint of the local boosters' club, is to carry them where it wants them diverted, to advertise the home town and patronize its merchants. No secretary of the local boosters could hold his job on any other terms. And no highway commissioner, of course, is worthy of his place who will not resist that pressure. * * * The budget, the Governor correctly says, is an "informed, fair, and unbiased attempt to develop the state's highway system." That is exactly what we want—except for the road in our own neighborhood. For that, a "fair and unbiased" decision is the last thing local pride will permit.

San Francisco Examiner Differs.

The San Francisco *Examiner* takes a different view. Editorially that paper says:

"Will the people be willing to substitute traffic pressure for political pressure as a basis for framing road programs?"

Governor C. C. Young asks that question in submitting to the state the budget for \$47,169,512 for all highway projects, just announced by the California Highway Commission. Of this \$15,000,000 is for new construction.

There is no question but that the answer will be "Yes."

For two years California "detoured" in its road-building program. Road construction stopped, and the state contented itself with merely patching existing highways.

With the induction of Governor Young in office a new program of road construction was adopted. The Governor strengthened the Highway Commission, and he set the new commission at work on devising a 10-year program that will give California the best system of roads in America. The Commission has not sprung a half-ripe policy on the public. Carefully it let the plans mature. A systematic study was made of road and traffic conditions, with a view not merely of constructing highways to meet present conditions, but to build for the future.

Governor Young has the wise policy of dealing candidly with the people of the state. Just as he issued the first complete budget for state expenditures, he now issues the first complete budget for road construction. He will find that the public will answer "Yes" to his question:

"Will the people be willing to substitute traffic pressure for political pressure as a basis for framing road programs?"

New Highway Chiefs Are Named

C. H. Purcell Appointed State Highway Engineer; C. C. Carleton Heads New Division of Contracts and Rights of Way

ANNOUNCEMENT of the appointment of C. H. Purcell, District Engineer of the U. S. Bureau of Public Roads, as State Highway Engineer, was made January 28th by B. B. Meek, Director of the Department of Public Works.

The announcement by Mr. Meek was made upon his completion of six months in the office of Public Works. During this six months Mr. Meek has devoted his time and attention to the intensive study of the organization and duties of the department.

The announcement also included a statement that the resignation of R. M. Morton, as State Highway Engineer, had been accepted. That in accordance with legislative authorization, a Division of Contracts and Rights of Way for the Department of Public Works had been created with C. C. Carleton of Los Angeles, for many years attorney for the California Highway Commission, as its chief; and that the proposed creation of the Division of Water Resources to include the present Divisions of Engineering and Irrigation, and that of Water Rights, had been postponed until further legislative sanction for their consolidation could be secured.

C. H. Purcell, newly appointed State Highway Engineer, is considered one of the foremost road engineers in the United States. He resided for a number of years in Los Angeles, attended Stanford University and later graduated from the University of Nebraska. He has had twenty-two years active experience in civil engineering. For the past fifteen years he has devoted himself exclusively to highway engineering, and for the past seven years has been connected with the U. S. Bureau of Public Roads of Washington, D. C., with assignment as District Engineer to the District comprising Oregon, Washington, Idaho and Montana, with headquarters at Portland. Prior to his connection with the U. S. Bureau of Public Roads, Mr. Purcell served as bridge engineer for the Columbia River Highway, Bridge Engineer for the Oregon State Highway Department, and Principal Assistant State Highway Engineer for the same department. An offer of appointment as State Highway Engineer of Oregon was declined by Mr. Purcell.

Mr. Purcell's experience also includes rail-

road construction and location, smelting and power developments, both in North and South America. He is an associate member of the American Society of Civil Engineers.



C. H. PURCELL.

Mr. Morton, whom Mr. Purcell will succeed, has been State Highway Engineer for the past five years. During this period, the highway organization has been concerned and has successfully dealt chiefly with maintenance problems.

Commenting upon the appointment of Mr. Purcell and Mr. Carleton, Director Meek of the Department of Public Works said: "Mr. Purcell is one of the outstanding figures in highway engineering in the United States today. His experience both in railroad and highway work will be invaluable in the new period of location and construction activities into which the California highway system is now entering.

"For six months I have been making an intensive study of the Department of Public Works both as to its organization and work. The Department covers a very wide field of activities of vital concern to every community in California. I felt that an intimate knowl-

ship with the affairs of the department of which its various divisions will be the beneficiary. I am extremely pleased that we have been able to again enlist him in the service of the state."

Redwood Grove In Del Norte County Saved by League

DESTRUCTION of a 20-acre tract of redwoods near Crescent City, California, has been halted and the preservation of this area as a public park has been assured through the efforts of the Save-the-Redwoods League in cooperation with the supervisors of Del Norte County and the Division of State Highways.

The grove in question, known as the Webber Tract, is the first piece of timber land reached on the new section of the Redwood Highway when traveling north of Crescent City, from which it is about four miles distant. A short while ago it was discovered that timber operators were rapidly destroying the trees in this tract and marring the beauty of the new highway. Mr. B. B. Meek, Director of the State Department of Public Works, and Mr. Ralph W. Bull, Chairman of the Division of State Highways, presented the matter to the League, which forthwith raised the sum of \$3,000, the contribution of a member of the League in southern California. The supervisors of Del Norte County were asked to appropriate \$2,500, which they did, thus completing the purchase price of \$5,500 for the property.

The acquisition of this property is in accordance with the League's policy of preserving, in so far as possible, the scenic beauty of the Redwood Highway.

In the furtherance of its program the League is urging the passage of the \$6,000,000 state park bond issue to go before the voters in November, 1928. It is hoped that by raising a fund to match dollar for dollar with a portion of the proceeds of this state park bond issue, the League will be able to save additional tracts of redwoods.

THE SIX LEGGED TETRAHEDRON

(Continued from page 4.)

cables, the construction of a temporary road into the river bottom, and a ditch which was necessary to deflect the river away from the construction work. The cost of the protection work, including all expenditures, was a little over \$7 per lineal foot.

Work was performed by a day labor crew with Foreman Roy Stover in charge.



C. C. CARLETON.

edge of the organization and the work was necessary before changes were contemplated either in personnel or policy. The highway budget announced this month has been the occasion of much study. Mr. Purcell, in my opinion, will bring to the Department an expert knowledge of road problems and highway methods that will be invaluable in the new era of road location and road building into which California has now entered.

"I also feel that the appointment of Mr. Carleton as Chief of the Legal Division of the Department of Public Works is one that can not fail to please the people of California. The duties of the Division of Contracts and Rights of Way will be to supervise and coordinate the legal right of way, claims, legislative, and other related activities of the Department. Mr. Carleton's long experience with the state highway organization has made him one of the foremost authorities of the nation upon road contracts and highway practices. He has an intimate acquaintance-

Mechanical Spreading, Raking, Finishing of Asphaltic Concrete Pavement

By C. S. POPE, Mem. Am. Soc. C. E., Construction Engineer, Division of Highways.

THE desirability of securing a machine which would mechanically spread, rake and finish asphaltic concrete has been evident for many years.

Objection has been made in the past that any machine used for spreading and finishing Portland cement concrete would not be suitable for asphaltic concrete, because the asphaltic concrete would stick to the spreading and leveling devices if they were not heated or oiled, and further, that such machines were not provided with suitable rakes which are essential in asphaltic concrete construction.



C. S. POPE.

It was the belief of the writer that the use of an ordinary spreading machine such as is used for spreading and kneading or tamping Portland cement concrete pavement would not give the results which were desired and, therefore, it was decided to remodel an Ord finishing machine by placing a rake in the machine in such a position that it would satisfactorily rake the material into longitudinal furrows. It was thought extremely important that the furrows should be longitudinal, since the material would then be raked in such a manner that if there was any incipient deformation, it will be through the formation of longitudinal ruts of slight elevation rather than through the formation of transverse waves which are the curse of pavements of this type.

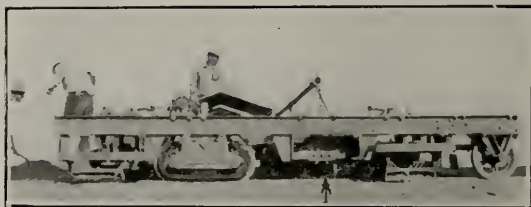
The machine described herein was placed on a contract for asphaltic concrete surfacing, some eight miles in length in Kern County, California, near the town of Delano. Its success was almost immediately evident and led, not only to the purchase of the machine by the contractor but also to the purchase of a similar machine for an adjoining contract of similar length.

DESCRIPTION

The machine consists essentially of a motor-driven steel framework running on flanged wheels resting on the side forms.

A spreading blade which is adjustable for height spans the width of the pavement at the front end of the machine.

Back of this blade, the raking teeth which are inclined to lift the mixture are arranged in rows attached to shafts or channels in such



View showing rakes of new machine.

a manner that they may be lifted or given any desired inclination.

So far, the work indicates that two rows of teeth spaced six-inch centers are sufficient.

Such an arrangement forms the furrows three inches on centers and gives a sufficient loosening and distributing action.

Back of the raking teeth is a second strike-off and finishing plate also spanning the full width of the pavement.

Both strike-off plates are set vertical and have a sidewise motion which shears the material and permits the machine to advance with the use of a minimum of power. While the present rakes do not vibrate, it is planned that they shall be arranged to do so in subsequent machines.

The hand wheels, by means of which the strike-off blades are adjusted to the proper elevation, are shown in plate D.

The raking apparatus was, therefore, so arranged that the furrows should be made longitudinally and practically straight. Should a slight waviness of the furrows occur, due to the necessity of vibrating the teeth, it will probably not be found detrimental. The use of teeth is believed essential to secure uniform texture in the mixture upon the road.

In the practice it was found that in cases where the mixture was piled up in front of the screeds or strike-off blades to a greater extent near one end than

at the other, without the use of the rakes, certain areas showed that an increased weight of material had been accumulated by being packed down under the weight of the first screed and the second screed by merely continuing the process gave a pavement, while it had a smooth surface, was really of nonuniform density in different parts of the cross-section. The use of the rake broke up this condition and allowed the second screed to spread the material more uniformly than if the rakes were not used.

The use of the raking and finishing machine will, it is believed, accomplish several objects. One of these is that it removes the unevenness of surface which causes of shock and therefore deformation of the pavement, and the other is that it gives a proper distribution of material over the whole surface so that there is no possibility of any accumulation of material in any one area which would have a density different from that of the rest of the pavement, which would lead to an uneven cross-section or a high place in the surface.

PAVING OPERATION

The most efficient method of operation in the widening and surfacing of an old pavement is as follows:

The shoulder widening is first spread to the level of the old paving and rolled. The old concrete base is painted with a coat of emulsified asphalt which provides a tack coat for the leveling course.



The machine at work.

The header boards or side forms which are of wood three inches in width are set to the grade of the leveling course or base.

The asphaltic concrete mixture is hauled to the work in 3½-ton, pneumatic-tired trucks and is spread by means of small spreader boxes for the shoulder widening and by large boxes about nine feet in width for the leveling course or base.

The spreader boxes distribute the hot mix in excellent position for subsequent work.

The mechanical finisher is then set to work spreading, raking and finishing the leveling course and is immediately followed by the rollers necessary to compress the asphaltic concrete.

After the leveling course has progressed a sufficient distance, the mechanical finisher is returned to the location of the surface already spread and the spreading of the surface is begun.

In order to secure the thickness required for the surface course a wood strip 1½ or 2 inches in thickness is nailed on the base of leveling course side form and to secure the necessary extra height of surface required to compensate for the compression of the asphaltic concrete surface given by the rollers, steel

STOCK SALT IS USED TO MELT ICE SURFACE ON MOUNTAIN HIGHWAY

On the Pacific Highway in the vicinity of Weed, difficulties are encountered by the freezing of snow and the formation of ice on the concrete pavement. This is particularly true on curves, especially where occurring on maximum grades.

This condition, in part, is overcome, in so far as slipperiness is concerned, and the road rendered reasonably safe for travel, by a thorough sanding of the surface. Under this method there is a tendency to build up the ice sheet and prolong the hazard to the public, as well as materially increasing maintenance costs, due to purchase of materials and their daily application. In an endeavor to overcome delay, to reduce costs, and render better service to the public, various substances and methods have been tried in the past on the ice sheets. The results indicate that the application of approximately fifty pounds of stock salt to 400 lineal feet of 18-foot pavement, evenly broadcast by hand, will so decompose an ice sheet two to three inches in thickness, that in the course of four to five hours it can be removed by means of a towing grader powered by a 30-h.p. tractor.

The use of salt is not advanced as a cure-all for ice conditions. Its use, however, is justified at times, especially when melting is delayed, or where grades or curvature make it imperative to remedy the condition at once, and where sanding is either not economical or ineffective. For the treatment of the block ice or thin glaze, sanding by means of hand shoveling or spreader trucks is the most effective.

plates ¾ inch in thickness by 3 inches in width are temporarily nailed to the top of the header strips. These plates are removed just in front of the rolling.

After the first passage of the rollers over the surface, the finish coat or void filling coat consisting of fine broken stone or gravel coated with asphaltic cement is drifted onto the surface and immediately rolled into the pavement. The result is a smooth, uniform, nonskid surface.

The spreading, raking and finishing machine operates at a speed of about 250 feet per hour and will easily spread 400 tons of hot mixture per day, on a 20-foot width of roadway.

ADVANTAGES

The advantages obtained by the use of this machine consists of

- (a) Economy of material;
- (b) Decrease in hand labor;
- (c) Increase in smoothness of paving.

In ordinary hand-raked work even with careful supervision, there is a loss or excess of material used, due to uneven spreading of base or surface. The cross-section of the finished pavement may vary considerably from the established cross-section and yet not be apparent to the eye. Also, there may be a uniform thickening of surface which is not observable even though the cross-section be correct. With the use of these machines, this extra material is very largely saved and its amount is estimated by engineers in the field at from 3 to 10 per cent of the material used for surfacing.

Highway Finance Puts on Long Pants

Deputy Director of Department Tells Meaning of Road Budget

By CORNING DE SAULES, Deputy Director, Department of Public Works.

THE ADVENT of the three-cent gasoline tax as the means of providing funds for state highway purposes happily coincides with the advent of complete and effective budgetary control of the state's finances inaugurated by Governor Young's budget to the legislature for the current biennium.

The principles of budgetary finance are much more effectively applicable to the continuous flow of income promised by the three-cent gasoline tax than to the former definite blocks of funds provided by periodic bond issues.

WHAT THE BUDGET MEANS

Administrative control of these current funds, through the medium of a budget, means that it will be possible to formulate plans covering a longer period of time

and according to determined state highway needs with assurance of their completion. By the budgeting of funds in accordance with such plans, the public may be assured that allotments for specific maintenance, construction and reconstruction projects may no longer be switched or diverted to other purposes in response to the pressure of localized ideas or influences.

It means that it may no longer be that the fastest fellow to the state treasury is the first to get completed roads. And that the day of the so-called political road is along with yesterday in the past.

EASIER TO CHANGE THAN TO CONVERT

It would be strange if such a radical change from the preexisting order of things did not elicit some opposition in quarters where the logical restrictions of any effective plan of

financial control would be considered irksome. To these "Can't-be-doners" we have neither a message nor an appeal. It is easier to replace than to convert them.

The state highway budget for the current biennium aggregates \$47,411,012. Each dollar of this sum is allocated to a definite project, purpose or function.

FIELD PROCEDURE UNCHANGED

The administration of the budget is, primarily, a headquarters function. There will be but little if any change of procedure in the field. The system of work orders and accounts recently devised and installed is designed to furnish the information and data necessary to the successful operation of a budget. It is expected, however, and required that district engineers will be always mindful of their responsibility for the holding of expenditures within the limitations set by approved work orders.

"WORK ORDER" ORDERS

Because it will always be possible to obtain supplemental work orders in the event of actual and obvious need, it will never be necessary or permissible for expenditures to accrue in excess of approved work orders. The application of an unexpended balance of one work order to an overexpenditure of another will no longer under any circumstance be countenanced.

While the administration of the budget is essentially a headquarters task it, obviously, can be made difficult or easy in proportion to the measure of willing cooperation that comes from the staff in the field. It is to these "Builders of California" that we would convey an idea of the privilege that is theirs to have an active part in demonstrating the wisdom and advantage of the new and enlightened order of things pertaining to the completion and maintenance of the state highways.

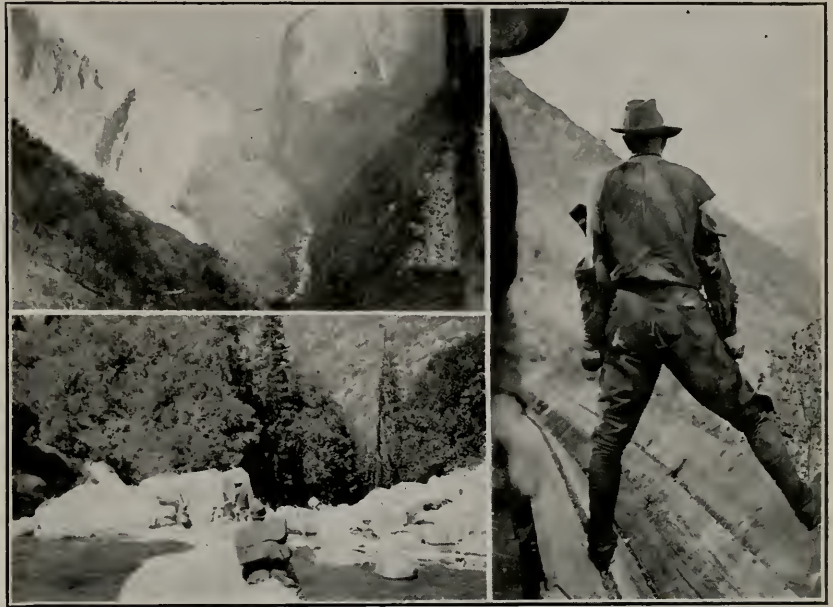
The task is of sufficient magnitude and importance to test the mettle of all whose imagination is sufficiently alert to visualize the opportunity that is here and ours to discard for all time our former financial swaddling clothes for the long pants of modern maturity.



CORNING DE SAULES.

Surveying in the Kings River Canyon

A reconnaissance survey is in progress in the Kings River Canyon. Picture on the upper left shows the rugged nature of the country through which the survey is being made. Below, the view of members of the party roped together in the bed of the stream. The picture on the right shows the heavy maintenance that the survey requires.



THE PASSING OF "PASSING-THE-BUCK"

(Continued from page 6.)

UNDERLYING PRINCIPLES

Here is the way that Mr. Heron tells the story of a change in State government reorganization and practices which he declares will in time be recognized as of epochal importance to the people of this state:

"The principle underlying the reorganization was that all agencies having similar functions to perform should be grouped into one department under a responsible head. The importance of this will be realized when it is stated, for instance, that previous to the coordination of the various state departments no less than five individual agencies were dealing with the relations of employer and employee, with a resultant overlapping and duplication of activity to the great annoyance of both employer and employee, and to the general disturbance of business. All these agencies today constitute one single Department of Industrial Relations, under a director who is responsible to the general manager of public business affairs, the Governor of the state.

"The second principle underlying the reorganization of 1927 was that of bringing

together the responsible heads of these executive departments. They in effect constitute a board of directors for the state. The Council meets with the Governor at least once every month to report for their respective departments, both as regards the policies and the problems of these departments, and to return to their work, each charged with the responsibility of securing results for the people of the state.

"For the first time in America, a state has a responsible board of executive directors, who meet monthly with the general manager of that great corporation which they represent, namely—the State of California. To this meeting, the stockholders and customers of that corporation are always welcome. The door of the chamber, where the meetings of the Governor's Council are held, is wide open. There are no star chamber sessions or secret discussions."

THE PEOPLE APPLAUD

Mr. Heron is right.

The Governor's Council has made buck-passing exceedingly difficult in the conduct of California's affairs.

And the people are already applauding; although as yet they may but vaguely understand the significance of the great change that has taken place in Sacramento.



The new bridge and the old ferry.

Huge Steel Bridge Replaces Cable Ferry Over the Colorado River

AS THIS issue of CALIFORNIA HIGHWAYS AND PUBLIC WORKS is going to press a new interstate highway connection is being completed in the form of a massive steel bridge across the Colorado River connecting the town of Blythe, California, with Arizona and replacing the cable ferry which has been in operation at this location for years. Although the new bridge is not, in reality, a portion of the California state highway system, it is an extension to Route 64 which terminates at Blythe. It is a Riverside County toll bridge project.

THIRD COLORADO CROSSING

This new bridge is the third crossing to be built over the 250-mile portion of the lower Colorado River forming the boundary between the states of California and Arizona, the two other bridges being at Yuma and at Topoe near Needles. Through its uncertainty of action during flood seasons, the river has been a formidable barrier to interstate travel requiring extensive construction work to bridge it. The cable ferries propelled by the current have had their time at each of the three main crossings but were uncertain and dangerous. With the increase of travel, they have given way to huge steel structures.

TELLS OF DEVELOPMENT

Mr. T. Mahneke, Secretary of the Palo Verde Valley Chamber of Commerce, who has courteously furnished the accompanying photographs writes as follows:

"The opening of the Blythe-Ehrenberg bridge about March 1st of this year marks the completion of another development that is of vast importance to the traveling public, and means the adequate improvement of the Sunkist Trail in both California and Arizona.

"The necessity of developing this short route between Los Angeles, California, and Phoenix, Arizona, has been recognized by economists and engineers for many years. The lack of engineering obstacles and low cost of future maintenance is what is prompting the activity on this short all-year route to Phoenix and the east.

OLD MINING TOWN

"In the early days, when the Butterfield stages crossed the continent, this route was in use to carry passengers, mails and expressage. Crossing the Colorado River near Blythe was made by ferry at the historic Arizona town of Ehrenberg, which about the year 1870 was a flourishing mining town of 5000 people. Ehrenberg was also at one time the county



seat of Yuma County and fate now decrees that the approach to this new bridge pass through the adobe ruins of what once was used as the county courthouse.

"The advent of the automobile has changed the old stage route of 1868 from a rough trail to a modern highway. The new bridge now replaces the cable and power ferries whose progress was often interfered with by torrential freshets and shifting sand bars."

DESCRIPTION OF BRIDGE

The new bridge has five steel truss spans each 190 feet long, a total length of 950 feet. The roadway width is 20 feet and the height

(Continued on page 26.)

Prehistoric Civilization

Along the Lower Colorado

By E. Q. SULLIVAN, District Engineer, California Highway Commission.

THE Colorado River is now reached by three California highways all under state maintenance by the Division of Highways—the Yuma, Blythe and Needles routes. It may be of interest to cite evidences of migration of prehistoric people along the river.

Along the lower basin of this great river as far north as Topoc near Needles, certain markings have been found indicating that this region was once well known to the prehistoric races of Arizona and New Mexico who attained civilization far above that of any American Indian. Near Topoc is an area of approximately sixty acres known to us as the "Mystic maze." It is situated on the edge of the mesa overlooking the river. The loose rocks which once covered this area appear to have been raked into parallel rows about four feet apart, the direction of the rows varying in different portions of the area. The effect to the eye is similar to that of a California grape vineyard carefully laid out in rows for irrigating and cultivation.

The real occasion for the diligence and effort expended in arranging these rock ridges in straight and regular rows appears not to be known. It is believed by some, however, that this area was the scene of religious ceremonies.

The Topoc-Needles country appears to have been the northern limit of the migrations of these prehistoric people along the Colorado and it is gratifying and picturesque at least to think of these people holding annual meetings say in the summer time and pacing back and forth within the parallel lanes singing or chanting in rhythm with their antics. It is not unlikely that the river itself had a place among the religious beliefs. Its periodical rising, overflowing and receding through climatic changes in the great and remote upper basin could easily have been con-



Huge natural Indian head overlooking the Salton Sea. The ancient beach line can be seen on the rocks above and to the left indicating that the head was once below the surface of the inland sea.



Mystic maze near Topoc which is believed to have been the scene of prehistoric religious ceremonies.



Indian markings on rock.

(Continued on page 29.)

The January Traffic Count

On January 15th and 16th, a traffic count was taken at various stations on the California Highway System under the direction of T. H. Dennis, Acting Maintenance Engineer. In this article Mr. Dennis summarizes the result of the count. The count for particular stations will be found from pages 32 to 35, inclusive.

In March, 1909, when California's legislature enacted the "State Highways Act," there were some 28,600 vehicles registered within the state. Today, nineteen years later, our motor vehicle registration has reached the astounding total of 1,736,765, an increase of approximately 6100 per cent, or, expressed as a ratio in terms of population, where in 1909 there was one car to every 83 people, there is now one car to every 2½.

In view of this remarkable increase, obviously some assumption as to what the point of vehicle saturation will be and when reached, is necessary for any logical road planning. If we assume the point of saturation to be where there is one vehicle for every 1½ persons, that time can be predicted with reasonable accuracy, as there is a very definite relation between the rising trends of population and motor vehicle registration. The determination of where and to what extent this increase in traffic will affect our highways can likewise be predicted, as vehicles are registered by counties, and it is reasonable to assume present traffic at and between points where traffic is now counted will reflect that increase.

The necessity of determining this traffic became apparent in 1920, as naturally the heaviest traffic would dictate not only maintenance expenditures, but the widening and thickening of pavement surfaces as well.

The 103 stations selected at that time have gradually been increased until at present traffic is being counted biyearly at some 836 stations. In consequence, a measure of the usefulness of California's highways to its people, in terms of vehicle miles use, together with the necessity for their future improvement to meet traffic needs, is readily obtainable for any particular stretch of state highway.

Consecutive counts are taken over two-day periods biyearly, between the hours of 6 a.m. and 10 p.m. Sundays and Mondays are usually selected as typifying the daily variation, the seasonal being obtained by taking the counts during the mid-month periods of January and July.

In the count, vehicles are segregated in hourly periods, under the following classifications: passenger cars, light trucks (loaded and empty), heavy trucks (loaded and empty), horse-drawn vehicles, trailers, busses, and foreign cars; that is, cars registered outside the state.

As a matter of interest, certain salient points have been selected on the various routes for the purpose of comparing counts taken this year on January 15 and 16 with those taken in 1927 over a similar period.

The present census, based on the locations enumerated, show the following increases:

	For Sunday	For Monday
Main north and south routes.....	15%	7%
Laterals between inland and coast routes.....	30%	16%
Interstate connection routes.....	28%	20%
Recreational routes	51%	23%

Gain or loss in count for stations shown expressed as a percentage of similar count taken in 1927:

Route No.	Sunday		Monday	
	Gain %	Loss %	Gain %	Loss %
1. San Francisco to Oregon line.....	6			6
2. San Francisco to San Diego.....	18		10	
3. Sacramento to Oregon line via Marysville	6		10	
4. Sacramento to Los Angeles (Valley Rt.)	11		7	
5. Stockton to Santa Cruz via Oakland.....	21			5
6. Sacramento to Woodland Junction.....	13		9	
7. Tehama Junction to Benicia.....	17		0	0
8. Ignacio to Cordelia via Napa.....	38		17	
9. San Fernando to San Bernardino.....		7		3
10. San Lucas to Sequoia National Park.....	15		1	
*11. Sacramento to Riverton via Placerville.....	30			3
12. San Diego to El Centro.....		32		18
13. Salida to Sonora	50		14	
14. Albany to Martinez	42		4	
15. Route 1 near Calpella to Grass Valley.....	29		17	
16. Hopland to Lakeport	40		34	
17. Roseville to Nevada City.....	17		2	
18. Merced to El Portal	22		2	
19. Route 9 west of Claremont to Riverside	20		33	
20. Redding to Route 1 near Arcata.....	32		12	
21. Route 3 near Richvale to Quincy.....	23			2
22. San Juan Bautista to Route 32 via Hollister	40			7
23. Saugus to Bishop	24		14	
*24. Route 4 near Lodi to Valley Springs.....	159		11	
25. Nevada City to Downieville.....	78		59	
26. San Bernardino to El Centro.....		2		4
27. El Centro to Yuma	13		25	
28. Redding to Nevada line via Alturas.....	4			3
29. Red Bluff to Nevada line via Susanville.....	1		6	
31. San Bernardino to Jean	27		21	
32. Route 4 near Califa to Rt. 2 at Gilroy.....	60		21	
33. Route 4 near Bakersfield to Paso Robles	4		5	
34. Route 4 near Arno to Pine Grove.....	46		14	
*37. Auburn to Colfax	113		97	
43. San Bernardino to Big Bear Lake.....	9		137	
44. Boulder Creek to Redwood Park.....	41			32
47. Orland to Chico	78		22	
48. McDonalds to Wendling	31			9
49. Calistoga to Lower Lake	109		43	
51. Santa Rosa to Schellville	17		6	
52. Alto to Tiburon	117		50	
53. Fairfield to Lodi	15			12
55. San Francisco to Spring Valley dam.....	70		23	
57. Santa Maria to Bodfish via Bakersfield.....	9		143	
58. Mojave to Topoe	91		63	
60. El Rio to San Juan Capistrano.....		24		15
64. Mecca to Blythe	98		42	
65. Auburn to Sonora	55			2
68. San Francisco to Burlingame.....	21		3	
71. Crescent City to Oregon line.....		5		6

*Snow frolics occasion of high count.

(Continued on page 32.)

New President of Northern Club Sees Bright 1928 Outlook

H. J. Brunnier, San Francisco consulting structural engineer, is the new president of the California State Automobile Association.

His selection to leadership of the 76,000 motorists of Northern and Central California members of the northern clubs was made by the Association's Board of Directors at the first meeting of 1928.

Other officers of the Automobile Association elected for 1928 by the Board of Directors are: R. I. Bentley of San Francisco, president of the California Packing Corporation, first vice



H. J. BRUNNIER.

president; D. H. Lafferty of Santa Rosa, mortician and civic leader, second vice president; E. B. DeGolia of San Francisco, vice president of Marsh & McLennan, third vice president; George S. Forderer of San Francisco, president of the Forderer Cornice Works, treasurer. D. E. Watkins was again named secretary and general manager of the Association.

The new president of the Automobile Association has been a member of its Board of Directors for the past eight years. For the past seven years he has been continuously chairman of the Association's Highways Committee and in that capacity has directed the destinies of the organization's Highway Bureau. He has also been a member of the organization's executive and finance committees and has been a vice president of the Association for the past four years. President Brunnier succeeds Burton A. Towne of Lodi, who retires from the Association presidency after two successive terms.

Clear course ahead is the outlook for California motordom along the broad highway of 1928 is the statement made by Mr. Brunnier upon assuming office. Mr. Brunnier cited a few of the factors that promise to make 1928 a record year for motordom. He pointed out that the \$47,000,000 two-year program

TIMELY AUTO ACCIDENT PROPERLY "STAGED" PROVES ROAD ARGUMENT

(From the Martinez Gazette.)

Crockett, Jan. 28.—While Bert Meek, Director of the Bureau of Public Works, and State Highway Commissioner Fred S. Moody, with engineers of the Highway Department, were inspecting the dangerous intersection near the high school here, a passing auto stage was nearly wrecked in avoiding collision with another car at the blind right angle corner.

"That looks like a 'put up job,'" Meek laughingly remarked to Supervisor Oscar Olsson and County Engineer Ralph R. Arnold, who were endeavoring to impress on the state officials the necessity for safeguarding the dangerous intersection.

of highway construction just launched by California returns this state to its premier position as the road-building state of the Union.

New York Holds Hot Dog Stand Beauty Contest; 700 Stands Enter Competition

(Associated Press Dispatch.)

NEW YORK, Jan. 20.—Add to the list of outmoded American institutions the hot dog stand, with its thick odor of onions and frying wieners, its greasy counter and its jar of encrusted mustard.

It is to be replaced, if Mrs. John D. Rockefeller, Jr., and the American Civic Association have their way, by the wayside refreshment parlor.

In the first national beauty contest for these roadside rendezvous of hungry motorists, a tiny white hut nestling beside the highway near Plainfield, N. J., has been selected as the best example of a wayside refreshment stand which gratifies the eye as well as the purse and the palate. The Art Center of New York conducted the contest.

Seven hundred proprietors of wayside stands submitted photographs and designs of their places of business to the Art Center in the competition of comeliness for which Mrs. Rockefeller offered \$1,000 in prizes.

The Plainfield refreshment stand which won first place is Pinkie's Pantry, owned and run by Mrs. Laura M. Bamman. Built in colonial design under an old apple tree beside the concrete road, it was adjudged the best of the

(Continued on page 27.)

Feather River Lateral Route Decision

/ / / / / /

RECOMMENDATION that the North Fork of the Feather River be selected for the location of the state highway between Oroville and Quincy, with a proposed future extension of the road east to establish an interstate connection at the Nevada line was made February 17th to the members of the California Highway Commission by B. B. Meek, Director of the State Department of Public Works, and was officially adopted by vote of the Commission.

This road is expected, because of its freedom from snow, to become the major artery for winter travel into northern California.

Mr. Meek's recommendation that the North Fork routing be officially selected was based upon two premises:

1. An opinion by Attorney General Webb, concurred in by C. C. Carleton, Attorney for the Department of Public Works, that the State Highway Commission is obligated to the North Fork routing by the constitutional amendment of 1919. This was the act in which \$40,000,000 of state highway bonds was voted. The road in question was included in that issue under the designation "The Feather River Route from Oroville to Quincy."

2. Reports by engineers of the Division of Highways that the North Fork would serve travel better than other suggested locations. The travel that would be more adequately served by a North Fork highway than by other proposed roads are classified as follows: recreational and commercial travel originating in California; travel between California and eastern Oregon, southern Idaho and northwestern Utah; tourist travel originating in the East and principally seeking recreational attractions.

The opinions of Attorney General Webb and Attorney C. C. Carleton that the constitutional amendment of 1919 obligated the State Highway Commission to the North Fork route was without proviso or qualification. The opinions held that all discretion in the matter had been withdrawn from the Commission by that act. Webb held that the act of 1919 substituted a definite North Fork routing for the provision of previous bond acts under which the construction of the Oroville-Quincy lateral had been authorized as a county seat connection. The present

legal obligation to choose the North Fork route, Attorney General Webb declared, could not be avoided by reason of any ambiguity or vagueness in the description of the road as given in the \$40,000,000 bond act. The intent of the act, he ruled, was capable of such easy and exact determination that there could be no uncertainty in the matter. This is the first time the Attorney General's formal opinion has been requested by highway officials.

Engineering reports relative to the routing centered about construction costs, mileage differences and the probable traffic use of the different routes proposed for suggested locations for this highway. Traffic, however, became the determining factor in the final recommendation of the Director. The conclusions as to traffic use were largely based upon studies as to points from which travel using the road would probably originate, and the probable destination of such traffic.

Engineering studies included the canyon of the North Fork of the Feather River; canyon of the Middle Fork of the same stream; and the so-called Ridge route, along which the present road between Oroville and Quincy is now situated, all of these routes being in the Feather River drainage area. The studies eliminated the latter route at an early stage and centered around the comparative advantages of the North Fork and Middle Fork.

Reports of the engineers assigned to these investigations showed that a road along the Middle Fork of the Feather River would be 24.6 miles less than the North Fork as between Oroville and the Nevada line, and 7.7 miles less between Oroville and Quincy. The following are the distances:

Oroville to the Nevada line: via the Middle Fork, 124.25 miles; via the North Fork, 148.85 miles.

Oroville to Quincy: via the Middle Fork, 73.3 miles; via the North Fork, 81 miles.

Cost estimates were given as follows: Oroville to Quincy via the Middle Fork, \$6,359,-880; via the North Fork, \$7,665,407.

The reports indicated that the presence of and cost of removing snow was not a serious problem on either location.

Against the lesser distance and lower construction cost of the Middle Fork, engineers reported that the North Fork offered a traffic

advantage that the Middle Fork did not possess.

A North Fork highway, the reports state, will serve recreational and commercial travel originating in California much better than a road along the Middle Fork. The chief recreational areas of the Feather River district, its larger industries and its principal settlements are situated, so the engineers report, to the north of the North Fork, and tributary to that stream rather than to the Middle Fork. It was predicted that this travel would constitute the bulk of traffic using the highway.

The North Fork was also declared to offer a shorter route between points in California and northern Nevada, southern Oregon and northwestern Utah than that of the Middle Fork.

The same reports held that transcontinental travel using the highway would be chiefly that of tourists to whom increased recreational attractions would be of greater importance than decreased road mileage.

It was the opinion that the advantages that the North Fork would afford to travel outweighed the advantage of lesser cost and lower mileage offered by the Middle Fork. Accordingly, Mr. Meek's recommendation was based both upon the traffic merit of the North Fork and the opinion of Attorney General Webb that the selection of the North Fork was obligatory upon the Highway Commission.

Mr. Meek's recommendation contemplates the construction, largely by convict labor, of a road with a minimum width of 20 feet, and with a minimum curve radius of 100 feet. Immediately upon the adoption of the route by the Highway Commission, engineers will begin final surveys and arrangements will be made for the installation of two convict camps upon the road. Pending completion of the road, the present Oroville-Quincy road will be maintained by state forces.

Announcement was also made that the new highway does not contemplate the utilization of the road built in the North Fork Canyon by combined efforts and joint funds of the Great Western Power Company and Butte and Plumas counties. The poor alignment of this road and its steep and adverse grades would require, to make it safe for traffic, an outlay of expenditure not warranted in the opinion of the engineers on a road later to be entirely abandoned. It is also stated that the location of this road is close to high power lines of the Great Western Power Company, and that its proximity to and location above the Western Pacific tracks offers building difficulties that make it inadvisable to attempt its use.

In general the new road will leave Oroville and proceed directly up the main Feather River and the North Fork to the West Branch of the North Fork. It will leave the North Fork there, cross over the top of Big Bend and descend into the North Fork again at a point near Pulga. From there on it will cross and recross the North Fork to secure a location on opposite bank of the river to that occupied by the Western Pacific. It will leave the North Fork at Howell's and proceed by the East Branch of the North Fork to Paxton. From there the route generally follows Indian Creek and Spanish Creek to Quincy.

The road will follow the river closely in order to afford travel opportunity of enjoying the beauty of the stream, and to make possible the maximum recreational development of the river.

The detailed routing is as follows: The highway will begin at the easterly limits of Oroville, traversing rolling foothills to the northeast for about five miles to the entrance of the Feather River canyon. It will cross both the Western Pacific tracks and the river at this point with one bridge. It will then follow the north bank of the river to the junction of the North Fork and Middle Fork, and thence along the west side of the North Fork to the mouth of the West Branch of the North Fork.

Continuing, the route follows the West Branch for half a mile, and then crosses Big Bend to Jarboe Gap, the elevation of which is 2400 feet. From there it again descends into the canyon of the North Fork to a point near Pulga, crossing both the railroad and the river at this place, and taking the opposite side of the river to that occupied by the Western Pacific. This bank of the river is followed to Tobin, where the river is again bridged to avoid the railroad, which at that point also crosses the stream. The road follows the north bank of the river to the junction of the North Fork and the East Branch of the North Fork at Howell's. Another crossing is made here. The East Branch is then followed to the junction of Indian Creek and Spanish Creek at Paxton. Thence the road follows Spanish Creek to Keddie. About a mile below Keddie the road leaves Spanish Creek and proceeds southerly over a low divide. Spanish Creek is again crossed just before the road enters Quincy.

Figures just compiled by the Department of Commerce show that the cost of travel by airplane per mile is 31.28 cents. Post Office Department figures during 1926 show that the average cost per mile, for carrying the mail, was \$1.087.

COMMUNICATIONS

Motor Vehicle Department Helps

January 18, 1928.

Mr. F. G. Snook, Chief,
Division of Motor Vehicles,
Sacramento, California.

Dear Sir:

I wish to express our appreciation of the efforts of your forces in advising of pavement defects and dangerous conditions along the highway.

While the cooperation extended has been uniformly excellent and very beneficial, our Foreman Lauritzen in Sonoma County feels that your man in that district, Mr. E. Roberts, is particularly deserving of mention. I quote herewith comment of Foreman Lauritzen.

"During the past few years the traffic officers in this section have cooperated with us in every way. They have been exceptionally prompt in reporting breaks in the pavement, slides and other dangerous conditions.

I especially wish to mention Mr. E. Roberts as one who seems to take considerable interest in the upkeep of the roads. While off duty in the evenings he has carried lanterns in his car, so in case of any mishap he could immediately warn the public. On his days off duty he has regulated traffic for us while we were painting traffic stripes, phoned to us on nights when there was a possibility of any danger, removed obstacles from the traveled way, and in numerous other ways showed his courtesy and efficiency as a traffic officer."

Yours very truly,

T. H. DENNIS,
Acting Maintenance Engineer.

Bay Shore Commendation

San Francisco, January 27, 1928.

California State Highway Commission,
State Building, San Francisco.

Gentlemen: Tendering to your honorable body the compliments of this holiday season, the Down Town Association takes the opportunity to express its appreciation of the excellent service you have done in promoting the development of California's state highway system, especially in the bay district and more especially on the San Francisco peninsula.

As a steadfast advocate of a second main highway from San Francisco to San Jose this Association realizes your intelligent understanding of the urgent need of such an outlet and your prompt action toward extending the Bay Shore road. This feeling is intensified by knowledge of the many projects in all other parts of the state which are pressed upon your attention and demand your careful study.

With good reason for trusting that during 1928 there will be no cessation of the energy you have displayed in responding to the appeal of the peninsula communities for additional facilities to relieve their ever-growing volume of highway traffic, we are

Very truly yours,

CONSTANT J. AUGER,
President.

T. P. ANDREWS,
Chairman Highways Committee.

WORLD RIDES PAST EL CAJON'S DOOR IN ITS MOTOR CARS

(From the El Cajon Valley News, January 20, 1928.)

The State Highway Commission of California requires its employees to report about twice a year as to the number and variety of cars being used on the system throughout the state, and last Sunday and Monday, J. D. Reeve, who has charge of the maintenance station east of Bostonia, performed that duty, assisted by the employees of the station.

The observation took place on the state highway west of El Cajon and travel was checked from 6 a.m. until 10 p.m., vehicles of all kinds passing both ways being noted.

During that time Sunday, 5249 vehicles passed, only one being horse drawn. All the others were propelled by gasoline power.

Of the total Sunday, 266 cars bore license plates from other states and countries than California. Baja California was represented by four, British Columbia by 2, and the District of Columbia, Hawaii and New Zealand by one each.

Of the 48 states in the Union, 41 were represented in the procession.

On Monday, 3350 vehicles passed and only two of them were horse drawn. The proportion of trucks to pleasure cars was somewhat larger than on Sunday and of the total 115 bore license plates from other states and countries.

STEEL BRIDGE REPLACES CABLE FERRY OVER COLORADO RIVER

(Continued from page 20.)

of the floor above high water is 30 feet.

It will be of interest to note that a straight line drawn across the map between the cities of Los Angeles, California, and Phoenix, Arizona, passes through Beaumont and Banning in the San Gorgonia pass and follows closely the route of the Sunkist Trail passing only a few miles north of the new bridge. With the age of motor transportation and highway development now in progress this route bids fair to become one of the main thoroughfares as in the days of the Butterfield stages.

Automobile production in the United States during November was 133,202 passenger cars and trucks, compared with 256,300 cars and trucks produced in November of last year, according to monthly production figures of the Department of Commerce.

A copy of the letter was sent to Governor Young and brought the following response:

"Thanking you for the letter which the Down Town Association sent to our State Highway Commission, I believe that you will find this Commission very active and vigilant in its attention to the highway needs of our state, and I am naturally pleased when an organization such as yours sees fit to recognize the work the Commission is doing.

Yours very sincerely,

C. C. YOUNG, Governor.

Story of Pioneer Mountain Springs Highway is Told

THE January issue of *Concrete Highways and Public Improvement* contains a most interesting article on the Mountain Springs grade on the San Diego-El Centro Highway, written by Sam S. Porter, chairman of the Good Roads Committee of the San Diego Chamber of Commerce. The article is of value to real estate and gives an interesting historical account of the road and its development. In part Mr. Porter writes:

In the bleak region between the Colorado River and the Pacific coast a modern highway of concrete has been cut through the mountains and deserts which in the days of the gold rush took heavy toll in hardship and death of the hardy pioneers who sought to traverse the then little known country. Today, the highway engineer has blazed easy routes for motor travelers and has gone farther and laid over the mountains a gigantic ribbon of concrete to make the way smooth, easy and safe.

The new section reaches from the summit of the divide which separates the drainage basins of the Pacific Ocean and the Colorado River to the foot of the east slope by way of the Mountain Springs Grade. The highway takes its name, Mountain Springs Road, from the old relay station which in early days furnished fresh horses and brief rest for stage coach travelers, but today serves gasoline and supplies to the motorists who speed by on their way to the Pacific.

The original road was cut in the rocks that cover the area through the cooperative efforts of San Diego and Imperial counties. From time to time, after it became a part of the stated highway system, money was allotted to improve the tortuous trail and to widen it. Maintenance of the unpaved surface was heavy and as soon as the final alignment was made and money available, the California State Highway Commission scheduled the section for additional betterment and paving. A 20-foot cement concrete pavement was selected for the improvement and contract was awarded in August, 1926, to the firm of Jahn and Bressi, Los Angeles contractors.

The Mountain Springs Grade road is a revelation in location and alignment, easy curves and grades, safety features of super-elevation and curb provision on the canyon side. These, with the character of the paving built, reveal the progress the California Highway Commission has made.

Grading for the pavement on the Mountain Springs Grade presented some unusual difficulties. Due to the character of the ground, largely rock, surfacing dirt had to be hauled in and spread over the grade to provide an even, uniform sub-base. With super-elevations and reduction of grades, lengthening curve radii and increasing sight distances, a tremendous amount of earth and rock was moved. In many cases the rock was blasted several times before the pieces were small enough to be handled by a gasoline shovel.

As the result of a ruling of the supreme court of North Carolina, automobile drivers arrested for drunkenness are sentenced to shoveling dirt and repairing highways in the state.

MINNESOTANS SNOWBALL SNOWPLOWERS; NEW WAY TO KEEP TRADE AT HOME

(From Minnesota Highway News.)

Snow plowing has many thrills, but a new experience was reported to the state highway department last week by one of the district maintenance superintendents in western Minnesota. One of his snow-plowing crews approaching a village midway between two larger towns was met by a crowd of about 150 business men and other residents of the village who bombarded the snow-plowers with snow balls until they were forced to turn around. The excuse was given that if the road were opened some of the trade would go to the larger towns nearby.

NEW YORK HOLDS HOT DOG STAND BEAUTY CONTEST

(Continued from page 23.)

lot in point of practical and sanitary arrangement of service space, sightly arrangement of its wares, attractiveness, method of advertising, and economical use of facilities.

Second prize went to the Beehive, near Troy, N. Y., a severely simple utilitarian stand; third place to Young's stand outside of Ontario, Cal., and fourth to another California stand, the Hut, near San Diego, a ground-hugging little nook with palm-leaf thatched roof which the judges said harmonized admirably with the surrounding scenery.

ADJUDICATING WATER RIGHTS IN CALIFORNIA

(Continued from page 10.)

agency of the State Division of Water Rights, which acts as a fact-finding body for the superior court. Where only appropriative rights are involved, the proceeding may be initiated directly by the division, but if riparian or prescriptive rights are involved the proceeding must first be initiated in the superior court and then transferred to the division for investigation as referee.

To date the division, and its predecessor, the State Water Commission, have undertaken twenty adjudication proceedings, of which nine have already been terminated, and four others have been finally submitted to the superior court and are pending decrees. The results have been uniformly successful in avoiding trouble.

Mountain Roads of Northern Counties Open Despite Snow

By S. W. LOWDEN, District Maintenance Engineer.

IN ORDER to facilitate the transportation of winter freight and passengers over the highways, the snow removal program of District Two is in full swing.

Modern machinery available the present season has added new zest to the crews, with the resulting improvement to the traveling conditions and reduced costs to the state. On the section between Dunsmuir and Weed, Route 3, has been stationed a rotary plow, powered by a 60 h.p. tractor. On the section between Westwood and Susanville, Route 29, a smaller rotary plow has been placed, powered by a 30 h.p. tractor.

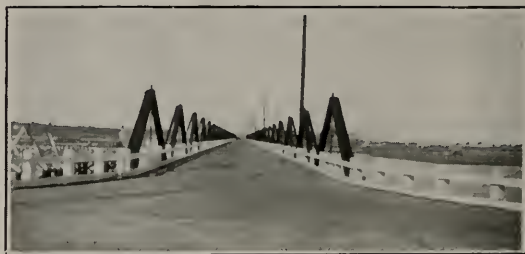
The rotary type has proven very effective. The rotors throw the snow from 30 to 40 feet laterally, and the snow cloud at times reaches a height of 20 feet. Fully 60 per cent of the snow picked up is thrown clear of the roadbed on the first trip. One noticeable advantage secured by this method of removal is the absence of an objectionable windrow of snow on the sides where, due to the concentration of the snow fall at this point and subsequent melting, trouble is likely to occur by reason of the excessive saturation of the subgrade. By the absence of a high snow bank, the formation of drifts has been retarded, as well as gutters and culverts being left in a condition to better handle the drainage, at a time when this is most urgently needed.

BEGIN WITH STORM

With the rotary type plow, as well as with the blade type, removal operations start with the storm, or as soon as the snowfall reaches a depth of two or three inches. The practice is to clear twelve to fourteen feet in the center of the roadway, by blade type plows, towing grader or truck plow, windrowing the snow on the side. This operation is followed immediately by the rotary, working on the banked snow, picking it up and throwing it clear of the roadbed. This method is economical, in that it permits the rotary to remove in one trip the snow it otherwise would require three or four trips to accomplish. Traffic is also better protected, as the greater speed of the lighter equipment allows a greater mileage to be covered on the preliminary removal. By keeping the heavier equipment on the side, an opening of reasonable width is maintained for passing traffic.

Rio Vista Bridge is Opened to Traffic

The approach to the Rio Vista Bridge on Route 53 built by special legislative appropriation of \$80,000, has just been completed and opened to traffic.



View of Rio Vista Bridge.

The bridge consists of 41 forty-foot timber truss spans and a 30-foot flair approach span connecting to the levy road. The bridge provides a clear width of roadway of 24 feet. The trusses are supported by creosoted Douglas fir piles varying from 80 feet to 90 feet in length. Bracing on the piles at the deepest point in the stream bed was placed by divers. The deck and trusses were constructed of Douglas fir timber treated with two brush coats of creosote oil.

Conforming with the existing bridge, over the main channel of the river, which has a lighting system, the approach was lighted with General Electric highway lighting units spaced at 240-foot centers installed at a height of 30 feet above the roadway.

BLADE PLOWS

On the sections from Montgomery Creek to Burney, Route 28, and from Paynes Creek to Mineral, Route 29, regions of lighter snowfall, blade plows of the balancing type have been stationed. These plows are giving very satisfactory results, and no difficulties to the traveling public are being encountered in traveling over these sections of highway.

Blade plows of the nonbalancing type are stationed on Buckhorn Summit, Route 20, and Cedarville Pass, Route 29, together with the usual accompaniment of lighter equipment.

The snow removal work done by the state forces, toward the keeping of the highways open at all times, has been the occasion of many favorable comments recently, most notable of which is a letter from the Westwood Auto Club, in appreciation of the effective work being done on Fredonia Summit, between Westwood and Susanville, by the state forces under Maintenance Superintendent E. J. Gribble.

CARING FOR THE DANGEROUS INSANE

(Continued from page 12.)

There is for instance, the case of one patient who, while confined to a particular ward, performs his duties with a high rating of efficiency. This man labors under the impression that he is being detained to satisfy the desire of others. Should this man escape, he no doubt would have but one thought in mind, that of assassinating certain persons whom he believes are responsible for his detention. This includes members of his own family.

One can realize from the above instance the problem involved in the housing of this type of insane person. Its solution as far as the housing problem is concerned has been accomplished as follows:

On the first floor is an entrance lobby, office, visitors' room, dining room, pantry, shoe room, clothes room, wash room, shower room, dressing room, general toilet room and 29 single rooms.

The second floor contains a hydiatic room for the hydrotherapy treatments which are the major treatments, wash room, general toilet rooms, an assembly and day room and 37 single rooms, all single rooms being approximately 7 feet 6 inches by 11 feet 6 inches.

Both floors of the building have necessary storage rooms and closets, night watch quarters and wide 8-foot corridors. The whole building has an abundance of natural light and ventilation and represents the last word in sanitation. Food is prepared in the institution's main kitchen and brought to this unit in containers where it is served from the pantry.

One of the many features of this building is the window opening arrangement. Windows are enclosed with steel sash and frames divided into small panels of wire glass. This makes it impossible to shatter the glass area or to make an exit should a glass panel be removed. The area of the window to open is constructed of double frame and muntins. The exterior section is glazed and the interior section unglazed and stationary, thus making a guarded opening after the exterior section is swung open. Metal rolling screens cover the openings. This style of window opening does away with the old method of installing steel bars, but still maintains an adequate degree of safety.

The capacity of the building for the present is 66 patients. However it is designed and constructed so that additions may be built later, the ultimate planned capacity being 300 patients. As the assembly and day room, dining room and pantry are centrally located it was necessary to build them of a size to meet the future capacity.

The assembly and day room has a projection room in connection, which enables the showing of films.

Four of the single rooms on the second floor are arranged to detain a patient in one room while under special observation.

The wash rooms, general toilets and shower rooms have tile floors and walls. The hydiatic room includes a continuous bath, ice pack sink, electric cabinet, sitz bath and showers, all being controlled by a series of Leonard control valves operated by an attendant which regulate the temperature of water to be used. The floors, walls and ceilings are covered with tile. All other floors of the building are covered with linoleum.

In the rear of the building is a yard enclosed with a masonry wall to permit sunning and exercise. The yard is provided with seats, shelters, walks and toilets. A heater room is located in the basement where a

steam control valve is placed which functions in the capacity of distributing steam from the high pressure line which is supplied from the institution's central boiler plant. A hot water storage tank and the main electric switchboard of the building are also located in the heater room.

The structure will be practically fireproof. It is built of reinforced concrete construction, having on the exterior a brick veneer base, stucco finished walls and clay tile roof of variegated colors. The design of the building is of rambling English style. The site of the building on the grounds of the Mendocino institution with its large spreading trees and natural shrubbery makes a pleasing and harmonious setting. Walks and drives are being constructed which will bring the building within easy access from the main institution's executive section. The Division of Architecture feels it will have accomplished a project and a purpose heretofore unsolved in the west with the completion of the special custodial unit at the Mendocino State Hospital, providing as it will for the confinement of all anti-social cases of insanity within the State of California.

PREHISTORIC CIVILIZATION ALONG THE LOWER COLORADO

(Continued from page 21.)

strued as supernatural phenomena. Hence the location of the "Mystic maze" on a site overlooking the river.

On the banks of the river between Yuma and Blythe are numerous markings on rocks which are beyond all question the work of human hands. The work involved in carving these figures with the crude tools known to have been in use by the prehistoric people would indicate that the story thus written was well worth writing. With this story is an unwritten and long forgotten story, perhaps equally significant and interesting, the story of the author, who he was, when he lived, and the motive for his work.

The Colorado River can be reached in about one day's drive from Los Angeles by three partially improved highways. Yuma, Arizona, can be reached via the Los Angeles and Imperial Valley and Borderland highways; Blythe can be reached by the Los Angeles to Imperial Valley highway and the Sunkist Trail via Thermal and Mecca; and Needles and Topoc can be reached via the Old Trails highway. The season for touring in this district is now at its best and will continue until about the first of May, providing a splendid opportunity for winter outing.

A total of 342,201 automobiles from the United States entered the Province of Ontario during the season of 1927, spending \$40,696,650, and represents an increase of 48.01 per cent over 1925, according to announcement by the American Motorists Association headquarters at Washington.

MECHANICAL SPREADING, RAK- ING, FINISHING OF ASPHALTIC CONCRETE PAVEMENT

(Continued from page 17.)

Ordinarily, the spreading of surface course $1\frac{1}{2}$ inch in thickness is a difficult matter but with this machine, it presents no difficulty whatever.

With asphalt concrete running from 1200 to 1800 tons per mile on 20-foot resurface at about \$5.50 per ton, the possible economy is readily apparent.

The immediate decrease in hand labor is not at once apparent though on one contract the labor crew is reduced to nine men including the foreman and machine operator for the spreading of 400 tons of mixture per 8-hour day. It is probable that future work will show a further reduction in labor so that the ultimate saving in men will be sufficient to influence a reduction in the prices bid for paving.

On asphaltic concrete spread by hand methods, tests made under the direction of the author indicate that an average smoothness of 18 units of roughness per mile, as shown by a roughometer, such as is used by the Bureau of Public Roads, was about the low limit that could be expected. This was about three times the roughness obtained on the best Portland cement concrete pavement on its completion.

The first few days' use of the asphalt concrete finish machine indicated that a roughness of not more than 10 units per mile could readily be obtained and that side sway of motor cars due to uneven cross-section was greatly reduced.

Since it is necessary to move the machine back on the job for the construction of surface after having laid base, means must be provided for its rapid transportation.

It is the opinion of the writer that the development of this machine presents a distinct advance in the art of paving as applied to asphaltic concrete and one that will have a far-reaching effect on the use of this material.

While the original idea of a mechanical finisher and its general details originated with and was pushed to a conclusion by the author, credit is due to many others for thoughts and ideas contributed during the construction and operation of the trial machine.

During May, 1927, W. F. Herin, Assistant Resident Engineer, and H. B. LaForge, Resident Engineer, in discussing the matter of more efficient spreading, advanced the idea that material might be spread by the use of strike-off blades drawn by hand. The author felt that it would be necessary to include a rake for the experimental work and that eventually the whole operation should be done by machine.

The first experiments were carried out by Mr. Earl Withycombe, Assistant Construction Engineer, on work near Merced and near Larkspur. These were so successful that arrangements were made with the Edward R. Bacon Company to secure an Ord tamper which was remodeled for the more extensive experiment. This machine was put in use as stated before during the latter part of September or early in October. Many points had to be worked out in the field for which great credit is due to Mr. Withycombe and also the contractors, Force, Currihan & McLeod who assisted in putting the machine on a sound working basis. There seems little doubt that the small expense to which the state has been subjected in the development of this machine will be repaid many times over in the better and more economical pavements which can be laid with this method.

SACRAMENTO-SAN JOAQUIN WATER PROBLEMS

(Continued from page 8.)

MUTUAL AGREEMENT WORKS

In the 1924 agreement adopted by the Permanent Committee and signed by the water users, provision to meet the immediate season's crisis was made in specifying the duties of and delegating certain authority to the Water Supervisor as respecting conservation measures and waste prevention. Looking more to the future, however, and to the ultimate solution of the problems it was specified that the Water Supervisor should commence the engineering investigation, the collection and recording of the hydrographic facts, most essential to an intelligent and permanent settlement in water difficulties of this nature.

The success attendant upon the 1924 conservation efforts was most noteworthy. The water users acceded readily to requested measures and accomplished much in the way of waste prevention and a careful use of water. After June there was not sufficient flow in the Sacramento River above Sacramento to maintain navigation, and, taking a lenient attitude, no attempt was made on the part of the U. S. War Department officers, charged with the maintenance of navigation, arbitrarily to enforce the superior legal rights of the federal government in this respect by enjoining water diversions. This confined the problem chiefly to the irrigationists and the pressing necessity of keeping fresh water flowing to the delta to save great areas of valuable crops there from the salt water encroachment.

WORTH WHILE SAVING

Through appeals made to the up-river water users by delta owners, members of the Permanent Committee and others at a meeting of water users called at Colusa by the committee at the time of the crisis in the last of July, the river flow was decidedly increased, and the salinity actually driven back many miles in the Sacramento Delta. The estimated saving to the delta resultant therefrom was decidedly worth while.

MEASUREMENTS AND RECORDS

The engineering and investigation commenced in 1924 and continued to date has included the following: Measurements and records of all diversions of water from the Sacramento, Feather, Yuba, American and Lower San Joaquin rivers within the valley floor and above the delta; stream flow

measurements throughout the territory, partially in cooperation with the Water Resources Branch, U. S. Geological Survey; measurement and record of waters returned to the Sacramento and San Joaquin rivers; intensive studies of the duty of water on peat and sedimentary lands in the delta region in cooperation with the U. S. Department of Agriculture, Division of Agricultural Engineering; yearly census of irrigated areas and crops under all diversions recorded and throughout the delta; and investigation and study of the advance and retreat of salinity in the delta channels.

PUMP DIVERSIONS PREVAIL

With the exception of four large gravity systems, all of the diversions recorded are by pumping. The diversion records obtained in 1926 included 211 on the Sacramento River above Sacramento, 35 on the Feather River, 6 on the Yuba, 29 on the American and 34 on San Joaquin River channels diverting to the delta uplands. The Sacramento River records show that there was a draft above Sacramento amounting to 953,000 acre-feet in 1924, 842,000 in 1925 and 1,104,000 in 1926. A considerable portion of this draft is returned to the river, however, and the return water is available for use in the lower river and delta. The flow of all channels carrying this return water to the river is measured and recorded. The 1924 measurements indicated a return above Sacramento for the four months, June to September, equal to 33 per cent of the draft. The 1925 figures showed a corresponding return for July to October equal to 40 per cent, and the 1926 return was 31 per cent. Each season three complete series of return water measurements have been made on the San Joaquin River and tributaries.

RIVER FLOW AND DRAFT COMPARED

It is interesting to note the relation between river flow, irrigation draft and return waters in the section of the Sacramento River between Red Bluff and Sacramento. In the month of July, 1926, there was an average draft of 3850 cubic feet of water per second, yet with a flow of only 3190 cubic feet per second at Red Bluff and a combined inflow of 660 cubic feet per second from the Feather and American rivers, there was a flow of 1880 cubic feet per second passing Sacramento. The return water, therefore, between Red Bluff and Sacramento amounted to 1880 cubic feet per second. Of this amount, however, 330 cubic feet per second was water reaching the river as return from lands irrigated by Feather River diversions.

DATA DIFFICULT TO GET

Within the delta it is not feasible nor practical to measure and record the countless number of diversions by siphon, gravity and pumping as well as the concurrent drainage pumping, which is considerable. Here the consumptive use of water must be estimated by applying the best "duty of water" figures obtainable to the various areas irrigated and cropped as shown by the yearly census. The proper determination of the "duty of water" data for peat and sedimentary soils, for different crops, etc., is the somewhat difficult task here involved. The detailed and intensive investigations along this line to date have been conducted on Medford and King Islands near Stockton for the peat soils, and on Reclamation District 999 near Sacramento for sedimentary soils. This work required the installation and use of many different water measuring devices and calls for a considerable amount of ingenuity and skill upon the part of engineers in getting reliable results.

THE SALINITY PROBLEM

The encroachment into the delta channels of salt water from San Francisco Bay when in dry seasons there is insufficient flow of fresh water in the rivers to hold it back is a serious problem. Each season investigations have been carried on to determine, by means of testing water samples taken at two- or four-day intervals at stations throughout the delta, the movements and behavior of the salinity. Chief of the objectives in this work is the determination of the relation existing between the advance and retreat of the salt at various delta points and the discharge of the rivers to the delta. With records of the Sacramento River flow at Sacramento and the San Joaquin River flow near Vernalis, available since 1924, the work to date has demonstrated this relation within somewhat wide limits. Should reservoir storage become available at some future time as a means of controlling the salinity, the value of a knowledge of the required discharge and proper time for storage release is obvious. As an aid to the delta irrigators in avoiding the use of water with too high a salt content, bulletins showing the results of tests are mailed throughout the delta once a week during critical periods.

1926 AND 1927 HIGHLIGHTS

The run-off of the San Francisco Bay drainage for the year 1926-1927 was 108 per cent of normal and in the 1927 irrigation season there were no difficulties encountered except in the maintenance of a sufficient flow for navigation in the vicinity of Colusa. Here

the flow dropped to a minimum of 2000 cubic feet per second. Salinity to the extent of 100 parts chlorine per 100,000 (roughly, the danger mark in irrigation) did not reach higher than a short distance above Antioch and Collinsville. The run-off for 1925-1926 was only 55 per cent of normal and during the season of 1926 both irrigation and navigation difficulties required considerable work in the way of conservation and waste prevention. Excellent response from the water users was received and all that could be accomplished through waste prevention and voluntary diversion reductions was done. In spite of this, however, it was not possible to maintain navigation throughout the season and this could only have been accomplished by more drastic measures eliminating some of the areas watered. Salinity of 100 parts per 100,000 encroached above Rio Vista and as far as Bouldin Island and Palm Tract in 1926.

SECOND CONFERENCE CALLED

At the close of the 1924 season's work which, it should be noted, was almost entirely financed by the water users themselves to the extent of some \$17,000, a second River Problems Conference was called. This was held at Sacramento on December 12, 1924. The season's work was reviewed and the Permanent Committee presented its report and recommendations. This conference voted to continue the committee and recommended that the state legislature be asked to appropriate funds to continue the work of the Water Supervisor. This the legislature did and the last appropriation insures the continuation of the work until July 1, 1929.

PROGRESS REVIEWED

With the completion of the fourth season's operation under the methods and plans initiated by the 1924 Water Users Agreement, an outcome of the First River Problems Conference, an opportunity is presented to review such progress as may have been made in dealing with Sacramento-San Joaquin water problems.

Of prime importance, the efforts to date have come as a result of, and have strengthened, the spirit of cooperation, welding together the various diverse interests so as to make the best of the situation and avoid expensive and extended litigation. Following the Antioch suit, one of much greater proportions was filed. The loss in time, money and retarded development which would be entailed by the trial of this suit is fearful to contemplate. But with the action of the River Problems Conference, the Permanent

Committee and the state for a constructive solution of the difficulties this suit has not been pressed.

In the Permanent Committee and River Problems Conference there has been created a most fortunate medium for dealing with the problems involved; and at present, the committee, influential and representative, stands ready as the proper body to forward all constructive plans for bettering the river conditions.

In the collection of the four years' records of the use of water and other fundamental physical facts and data, a necessary and important step has been taken leading to the ultimate adjudication, mutual agreement or other adjustment which may be consummated as a basis for water distribution.

The procedure to date has been to make the best of the situation through conservation. This includes water supervision or water master service which is essentially a conservation feature. Until such time as additional water supplies are made available through storage or otherwise, this will undoubtedly continue to be the best and only reasonable procedure.

TRAFFIC CENSUS

(Continued from page 22.)

Route 1. San Francisco to Oregon Line.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
	16	17	15	16
San Rafael, north of city at top of hill	3,383	1,972	4,299	1,609
Petaluma north of city-----	3,866	4,096	4,945	3,871
Santa Rosa, south of city, Triangle service station-----	2,467	1,902	2,798	1,821
Santa Rosa, north of city at railroad crossing-----	2,812	2,395	3,079	2,472
Healdsburg, south of city at railroad crossing-----	1,894	1,511	1,797	1,331
Ukiah, south of city, junction route 70	932	794	797	980
Ukiah, north of city, junction route 15 to Colusa-----	741	674	885	616
Willits, north of city, junction road to Ft. Bragg-----	355	342	370	268
Eureka, south of city limits-----	3,268	1,997	2,753	1,813
Arcata, north of city at junction route 20-----	1,806	1,051	1,222	893
Crescent City, junction of road-----	578	376	460	434
At Oregon line-----	43	37	70	63

Route 2. San Francisco to San Diego.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
	16	17	15	16
Colma, junction road to South San Francisco-----	15,626	6,365	18,497	8,767
San Bruno Junction Bay Shore Road-----	16,544	8,648	20,561	8,444
San Mateo, south of city at 16th Ave-----	15,722	8,800	19,231	9,461
Redwood City, north of city limits-----	13,107	9,883	16,122	8,513
Palo Alto, at road to Federal Tel. Sta-----	10,539	5,968	11,512	5,834
San Jose, north of city at lumber yard-----	14,250	18,905	16,289	17,159
San Jose, south of city limits-----	4,187	4,136	6,098	5,464
Gilroy, north of city, junction road to Watsonville-----	3,542	3,404	4,861	3,353
Salinas, south of city limits-----	1,513	1,551	1,995	1,701
Paso Robles, north of city limits-----	951	838	1,028	880
Paso Robles, south of city limits-----	1,458	1,197	1,631	1,229
San Luis Obispo, north of city limits-----	1,580	1,235	1,777	1,268
San Luis Obispo, south of city limits at railroad crossing-----	2,451	1,686	2,791	1,910
Santa Maria, north of city junction Route 57 to Bakersfield-----	1,658	996	1,671	1,178

Santa Barbara, west of city, junction San Marcos road	1,490	611	2,865	1,864
Santa Barbara, 300 feet east of city limits	4,448	2,995	5,836	4,928
Ventura, west of city at bridge	4,419	2,166	6,106	4,466
Ventura, west of city limits	5,288	3,442	5,208	3,710
Los Angeles, east at Indiana St.	19,469	17,103	21,462	19,330
Whittier, at junction with Hadley St.	9,305	7,069	13,001	9,667
Anaheim, north of city limits	9,966	7,323	11,315	8,362
Santa Ana, north of city at junction county road to Orange	8,767	6,177	8,976	6,659
San Juan Capistrano, north of city	3,731	2,001	3,392	1,955
Oceanside, near south city limits	4,701	2,872	4,701	3,147
Delmar, at Santa Fe Railroad crossing	4,401	2,988	4,086	2,409

Route 3. Sacramento to Oregon Line, via Marysville.

Station	January, 1927 Sun. Mon.	January, 1928 Sun. Mon.
Sacramento, north at junction with Garden Highway	8,782	8,623
Marysville, south of city at junction Hamilton road	1,768	1,906
Yuba City, north of city at junction route 15	1,886	1,934
Chico, at junction county road to De Saba	1,736	1,739
Chico, north of city, junction county road east	804	679
Red Bluff, at junction route 29 to Susanville	838	850
Redding, south of city, junction route 28 to Alturas	1,304	1,324
Dunsmuir, north of city limits at bridge	1,658	1,314
Yreka, south city limits	1,029	899
At Oregon line	508	307

Route 4. Sacramento to Los Angeles (Valley Route).

Station	January, 1927 Sun. Mon.	January, 1928 Sun. Mon.
Sacramento, south of city limits	4,845	4,429
Lodi, junction route 24 to San Andreas	2,444	2,146
Stockton, north of city, junction county road to Lockeford	4,194	3,952
Modesto, north of city	4,384	4,041
Modesto, south of city	4,256	3,869
Turlock, north of city	3,064	2,565
Turlock, south of city	3,038	2,346
Atwater, north of city	2,271	2,112
Merced, north of city at bridge	2,949	2,607
Merced, south of city at bridge	2,053	1,837
Fresno, south at maintenance yard	7,170	6,896
Kingsburg, south of city near Kings River bridge	2,092	1,667
Tulare, south city limits	2,187	1,981
Bakersfield, north of city, junction county road to Oil Center	5,252	4,441
Castaile, junction county road to Santa Paula	3,225	2,062
Sangus, junction route 32 to Mojave	5,688	2,658
Newhall, end of section L. A.-4-E.	8,128	3,011

Route 5. Stockton to Santa Cruz via Oakland.

Station	January, 1927 Sun. Mon.	January, 1928 Sun. Mon.
Tracy, west of city, junction county road to Byron	2,906	1,804
Livermore, east of city, junction county road to Livermore	1,524	1,147
Hayward, junction with Castro Valley road	2,682	2,091
Niles, junction Niles Canyon road	3,369	2,474
Nine miles north of San Jose, junction county road to Centerville	5,175	2,316
Five miles north of San Jose	6,082	3,043
San Jose, at north city limits	4,750	2,934
San Jose, west of city at sanitarium	5,864	7,666
Los Gatos, northeast of city	1,934	1,794
Santa Cruz, north of city	1,819	893

Route 6. Sacramento to Woodland Junction.

Station	January, 1927 Sun. Mon.	January, 1928 Sun. Mon.
West of Sacramento, at underpass	3,755	2,697
Davis, east of city, at underpass	2,915	2,397

Route 7. Tehama Junction to Benicia.

Station	January, 1927 Sun. Mon.	January, 1928 Sun. Mon.
Benicia, north of city	502	275
Fairfield, east of city	2,270	1,635

Dixon, south of city	1,907	1,389	2,354	1,484
Woodland, south of city	2,012	1,802	2,189	1,670
Williams, south of city	924	720	1,054	769
Pasadena, south of city	864	1,025	1,055	950
Orland, at junction route 47 to Chico	784	1,070	892	865
Red Bluff, south of city at Reed Creek bridge	856	803	795	964

Route 9. San Fernando to San Bernardino.

Station	January, 1927 Sun. Mon.	January, 1928 Sun. Mon.
San Fernando, 1 mile east	3,049	1,183
La Crescenta, west of Pennsylvania Ave.	6,759	3,841
Pasadena, east of city limits	12,493	6,723
Azusa, west of city limits	12,905	4,792
Upland, east of city at junction county road to Upland	4,748	1,483
San Bernardino, west of city	5,731	3,145

Route 10. San Lucas to Sequoia National Park.

Station	January, 1927 Sun. Mon.	January, 1928 Sun. Mon.
San Lucas, south of city at junction route 2	140	131
Coalinga, west of city	438	333
Hanford, west of city limits	1,277	1,547
Hanford, east of city, intersection county road to Kingsburg and south to Corcoran	1,851	1,796
Visalia, east of city at Exeter Junction	1,065	858

Route 11. Sacramento to Nevada Line via Placerville.

Station	January, 1927 Sun. Mon.	January, 1928 Sun. Mon.
Sacramento, east of city limits	2,960	2,090
Folsom, west of city at junction with Pratt's road	965	654
Placerville, west of city	932	724
Placerville, east of city	537	506
Between Riverton and Kyburz	50	15

Route 12. San Diego to El Centro.

Station	January, 1927 Sun. Mon.	January, 1928 Sun. Mon.
San Diego, east of city, Euclid Ave. at Cajon Ave.	5,791	3,923
El Cajon, west of city limits	6,011	2,896
Jacumba, at junction county road to El Campo	549	339
El Centro, west of city at junction route 26 to San Bernardino	2,560	2,504

Route 13. Salida to Sonora.

Station	January, 1927 Sun. Mon.	January, 1928 Sun. Mon.
East of Salida, at McHenry's Ave. to Modesto	1,036	744
Oakdale, west of city	1,123	931
Sonora, south of city	1,118	845
Sonora, east of city	741	645

Route 14. Albany to Martinez.

Station	January, 1927 Sun. Mon.	January, 1928 Sun. Mon.
Albany, at county line	13,254	11,149
Junction county road to Richmond	9,854	7,579
Junction Franklin Canyon road	3,533	2,331
Crockett, 1 mile south of city, junction county road to Crockett	948	1,184
Martinez, west of city limits	564	474

Route 15. From Route 1 Near Calpella to Grass Valley.

Station	January, 1927 Sun. Mon.	January, 1928 Sun. Mon.
Ukiah, north at junction route 1	631	388
Mendocino and Lake County line	104	80
Near Venada, junction county road to Bartlett Springs	7	24
Williams, west of city	331	339
Williams, east of city	484	545
Colusa, east of city	611	811
Marysville, east of city	223	229
Grass Valley, west of city	147	161

Route 16. Hopland to Lakeport.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Hopland, at junction route 1-----	328	283	371	337
Lakeport, south of town-----	414	371	663	541

Route 17. Roseville to Nevada City.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Roseville, east of city-----	1,926	1,339	2,042	1,312
Auburn, south of city at S. P. R. R. crossing-----	1,374	1,075	1,725	1,309
Auburn, north of city at junction Country Club road-----	752	490	897	508
Grass Valley, south of city-----	660	499	771	421
Nevada City, south of city-----	852	878	1,074	843

Route 18. Merced to El Portal.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Merced, at intersection county road and 21st street-----	849	1,375	1,485	1,193
Merced, 12 miles east at junction county road to Le Grand-----	1,067	159	862	192
Mormon Bar, at junction county road to Mormon Bar-----	805	257	996	322
Briceburg, Bear Creek bridge-----	735	135	869	263

Route 19. From Route 9 West of Claremont to Riverside.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Between Pomona and Ontario, at Chino cross roads-----	6,972	2,889	12,023	6,551
Los Angeles County line, east limits of Pomona-----	12,788	6,364	12,337	6,510
Riverside, west of city near Santa Ana River bridge-----	6,609	4,495	7,373	5,226

Route 20. Route 1 Near Arcata to Redding.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Arcata, north of city at junction Rt. 1-----	675	441	848	423
Weaverville, 3 miles south-----	34	35	38	40
Between Redding and Tower House---	60	93	136	176

Route 21. Route 3 Near Richvale to Quincy.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Oroville, east of city-----	458	443	576	457
Quincy-----	51	74	54	51

Route 22. San Juan Bautista to Route 32 via Hollister.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
San Juan Bautista, south of city at junction route 2-----	1,085	1,001	1,470	907
Hollister, junction route 32-----	479	296	708	303

Route 23. Saugus to Bishop.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Saugus, junction with route 4-----	4,069	1,252	5,157	1,513
Lancaster, junction with route 59 to Neenach-----	897	645	1,464	899
Freeman, 1 mile north, junction to route 57-----	117	94	130	93
Lone Pine-----	549	575	489	534
Bishop, half mile north junction county road north and county road easterly--	426	376	302	321

Route 24. Route 4 Near Lodi to Valley Springs.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Lodi, junction route 4-----	1,012	1,005	1,363	1,103
Bet. San Andreas and Valley Springs--	256	212	1,925	248

Route 25. Nevada City to Downieville.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Nevada City, north of city-----	77	83	162	148
Comptonville, north of city-----	44	56	54	73

Route 26. San Bernardino to El Centro.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
San Bernardino, S. of city at N. end of Santa Ana Br. county rd. to Colton--	3,418	2,267	3,066	2,503
At intersection Mt. View Ave., west of Redlands-----	2,363	1,409	2,988	1,946
Beaumont, junction Jack Rabbit Trail--	2,436	1,212	1,771	1,173
Coachella, south of city at junction county road to Thermal and Mecca--	1,611	1,349	1,434	915
Westmorland at railroad crossing-----	1,584	1,499	2,023	1,715
Brawley Junction, southwest of city--	2,970	2,482	2,843	2,641
El Centro, west of city, junction Rt. 12	4,495	4,123	4,306	3,985

Route 27. El Centro to Yuma.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
El Centro, east of city at junction county road north to Brawley and south to Calexico-----	2,065	2,333	2,484	3,131
East of Holtville-----	1,367	1,288	1,572	1,585
Sand Hills maintenance station-----	764	372	792	518
Yuma, at S. D. A. plant quarantine station-----	2,446	1,820	2,658	2,031

Route 28. Redding to Nevada Line via Alturas.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Redding, south of city at junction with route 3-----	429	508	445	479
Four miles east of Pittville at maintenance station-----	81	88	103	87
Caulby-----	71	49	65	76
Twelve miles east of Alturas at maintenance station-----	46	60	43	39

Route 29. Red Bluff to Nevada Line via Susanville.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Red Bluff, east at junction route 3---	200	207	261	269
Susanville, 1 mile west of town-----	256	142	314	186
Susanville, 1 mile east of town-----	883	539	743	503
Five miles south of Constantia-----	64	40	53	50

Route 31. San Bernardino to Jean.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
San Bernardino, north of city at junction Mt. Vernon and Highland Aves.--	2,715	755	3,669	1,031
South of town limits of Victorville--	1,065	648	1,084	635
Southwest town limits of Barstow-----	311	262	457	350
Nevada state line-----	60	68	96	94

Route 32. Route 2 Near Gilroy to Route 4 Near Califa.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Hollister, junction with route 22-----	493	330	802	374
Pacheco Pass at Merced-Santa Clara County line-----	637	274	973	371
East of Los Banos at junction county road to Dos Palos-----	400	275	447	376
Califa-----	524	325	1,068	439

Route 33. Paso Robles to Route 4 Near Bakersfield.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Paso Robles, east of city-----	949	841	1,005	914
Paso Robles, $\frac{3}{4}$ mile east of city-----	482	458	618	488
Lost Hills, intersection of Main street--	315	213	218	233

Route 34. From Route 4 Near Arno to Pine Grove.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Twin Cities, junction route 4-----	264	216	304	282
West of Lone, junction county road to Michigan Bar-----	153	130	188	119
North of Jackson, junction route 65 to Placerville-----	459	434	634	461
Pine Grove, east of town-----	57	82	239	120

Route 37. Auburn to Nevada Line Near Verdi.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Auburn, east of city -----	704	562	1,370	1,155
Colfax, east of city, junction Nevada City road -----	121	125	392	200
Truckee, east of city, junction route 38 to Nevada -----	106	50	119	48

Route 43. San Bernardino to Big Bear Lake.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Foot of Waterman grade -----	842	144	966	350
Pinecrest, junction county road to Arrowhead Lake -----	251	13	175	30
Running Springs Park, junction City Creek road -----	55	18	57	No count
West end of bridge over Big Bear dam -----	14	7	58	18
One mile from end of route 43, junction county road to Pine Knot -----	75	25	89	30

Route 44. Boulder Creek to Redwood Park.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Boulder Creek at park line -----	264	353	373	239

Route 47. Orland to Chico.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Orland, junction with route 7 -----	315	398	565	490
Chico, west of city -----	371	367	1,077	834
Hamilton City, at Union High School -----	446	459	376	179

Route 48. McDonalds to Wendling.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
McDonald, junction route 1 -----	65	92	113	104
Wendling, 3 miles west of town -----	198	196	233	158

Route 49. Calistoga to Lower Lake.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
North of Calistoga at foot of grade -----	207	153	363	237
Lower Lake, junction Kelseyville and Lower Lake road -----	79	100	321	345
Middletown, junction Cobb Mtn. road -----	277	437	493	408

Route 51. Santa Rosa to Schellville.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Santa Rosa, east of city -----	2,212	1,680	2,461	1,762
Schellville, junction route 8 -----	487	302	712	342

Route 52. Alto to Tiburon.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Belvedere, junction -----	663	575	1,439	862

Route 53. Fairfield to Lodi.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Denverton, at overhead crossing -----	208	177	345	152
Rio Vista bridge -----	779	869	996	895
Walnut Creek bridge -----	169	246	246	252
Thornton, intersection county road -----	642	650	755	558
Lodi, north of city -----	1,041	1,143	931	860

Route 55. San Francisco to Spring Valley Dam.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
At swimming pool -----	7,292	1,557	10,101	1,866
Junction with county road to Colma -----	3,696	777	7,182	977
Junction with county road to Belmont at earth dam -----	1,391	324	3,740	427

Route 57. Santa Maria to Freeman via Bakersfield.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Santa Maria, north of city at junction route 2 -----	132	80	108	61
At San Luis Obispo-Kern County line -----	114	44	106	284
Maricopa, west of city -----	393	205	423	247
Bakersfield, 1 mile east of city limits -----	1,093	548	2,827	1,931
Bakersfield, 10 miles east at Country Club road -----	531	166	1,040	130
Bodfish, at intersection route 57 with county road to Caliente -----	96	76	77	75

Route 58. Mojave to Topoc.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Barstow, north of city at junction county road -----	189	198	207	209
Daggett, junction Arrowhead trail -----	146	129	285	267
Vicinity Amboy -----	79	72	128	148
Needles, west of city limits -----	127	108	416	206

Route 60. El Rio to San Juan Capistrano.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Santa Monica, 500 feet west of Santa Monica Canyon -----	11,792	3,900	10,035	2,940
Lomita -----	9,683	4,668	6,997	5,717
Seal Beach, at Los Angeles-Orange County line -----	12,743	8,048	10,182	5,714

Route 63. Big Pine to Oasis.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Big Pine, junction route 23 -----	65	59		

Route 64. Mecca to Blythe.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Desert Center -----	93	83	97	85
Blythe, S. D. A. quarantine station -----	125	82	336	150

Route 65. Auburn to Sonora (Mother Lode Highway).

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Auburn to wire bridge -----	91	95	156	88
Placerville, northwest of city, junction Georgetown road -----	53	60	97	78
El Dorado, south of city -----	80	122	203	106
Central House -----	204	247	357	258
North of Jackson, junction route 34 -----	593	661	748	630
South of San Andreas, at Sheep Camp -----	355	349	1,962	418
West of Sonora, junction county road south to Jamestown -----	73	111	219	135

Route 66. Manteca to Route 5 Near Mossdale School.

Mossdale, junction route 5 -----	1,736	1,176	1,728	988
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Route 68. San Francisco to Burlingame.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
San Bruno, junction with route 2 to San Francisco -----	5,005	3,589	5,866	3,372
North city limits of South San Francisco -----	5,000	4,113	6,292	4,603

Route 71. Crescent City to Oregon Line.

Station	January, 1927		January, 1928	
	Sun.	Mon.	Sun.	Mon.
Crescent City, N. of maintenance yard -----	575	502	526	480
At Oregon-California line -----	157	87	179	71

Route 8. Ignacio to Cordelia via Napa.

Station	1928		1927	
	Sun.	Mon.	Sun.	Mon.
Petaluma Creek bridge -----	1,113	290	Not taken	
Schellville, junction route 51 to Santa Rosa -----	878	756	709	382
Napa, junction county road to Vallejo -----	3,675	1,608	2,515	1,565
Cordelia, junction route 7 -----	2,742	1,433	2,066	1,285

PROGRESS REPORTS FROM THE FIELD

BUTTE COUNTY—A preliminary report of studies and investigations was completed the latter part of December, 1927, of practicable routes of a state highway location between Oroville and Quincy, District III, known as the Feather River Route. The report covers the investigations of three distinct routes and their several alternates, and are described as the North Fork Route, the Ridge Route and the Middle Fork Route. To facilitate final selection of an all-year interstate connection between Sacramento and Reno, there is being prepared, in connection with these studies, comparative profile and map of the routes.

DEL NORTE COUNTY—The contract for the grading and surfacing of a new roadway between the southerly Del Norte County line and the head of Richardson Creek, a distance of $3\frac{1}{2}$ miles, is now under contract to J. E. Johnston of Stockton. During the past month he has been moving his equipment in on the job and has been clearing the right of way and constructing the culverts. A great deal of this work being in rock, it will probably be possible for the contractor to continue his work throughout the winter.

Along that portion of the state highway on the rock cliffs south of Crescent City, state forces have been widening the roadway and taking off some of the sharpest turns at the various points. This work is making a great improvement in the alignment and making it possible for the safer passage of the traffic over this dangerous piece of roadway.

During the last month a large slide occurred approximately six miles north of Patricks Creek. This slide was not caused by reason of the highway construction. It was merely a large slice of rock off the mountain side which slipped into the river, taking over 200 feet of the roadway with it. The roadway which slid out still exists intact about 50 feet below the grade and 50 feet out towards the river. The slide dammed up the river for a short while.

State maintenance forces quickly constructed a temporary roadway over the slide and now have a power shovel at work constructing a wider and more permanent road through it. Before this slide is removed, it will probably require from 35,000 to 50,000 cubic yards of excavation.

FRESNO COUNTY—Work on extending of all of the culverts on the Golden State Highway, through Fresno County, has been started. These culverts will be extended to the right of way line, thus eliminating the last of the narrow, dangerous places on this section of the highway.

GLENN COUNTY—One mile of bituminous macadam pavement with rock borders between Four Corners and Butte City, road III Gle-45A, was completed December 3, 1927. C. K. Buchanan was the contractor.

HUMBOLDT COUNTY—The Hauser contract and the Engelhart contract for grading and surfacing between Orick and the northerly county line, a distance of 15 miles, are practically at a standstill, due to the winter rains.

State forces under day labor work are making a great improvement in the alignment on the roadway just south of Orick, cutting off the sharpest turns and widening the roadway on fills, which will make this a much safer road in the future.

INYO COUNTY—The contract of F. C. Payton, Coso Junction to Olancho, 21 miles grading, will be completed March 1, 1928. On this section, surfacing

by day labor of sandy portions is under way. Permission has been granted by the Railroad Commission to the Division of Highways for changing two crossings of Southern Pacific tracks at grade to the relocation.

Near the Black Springs, between Lone Pine and Cottonwood Creek, the timber bridge carrying the spillway flow from the aqueduct is, with the cooperation of the city of Los Angeles, being replaced by a 6-foot by 8-foot reinforced concrete culvert.

Plans and estimates submitted for advertising, for grading, surfacing and oiling, Alabama Gate to Diaz Lake, 8.5 miles.

Surveys completed for relocation, Olancho to Diaz Lake, 21 miles. Plans under way.

KERN COUNTY—Construction work on Route 10, Sierra-to-the-Sea Lateral west of Coalinga, is being started. The construction of several short-span bridges will take the road out of the creek bed and place it above danger of high water. Several changes in line are also proposed.

A gas shovel outfit and some tractors are starting work in the Kern River Canyon east of Bakersfield. This road will be widened and straightened to care for the increasingly heavy travel.

Contracts in Kern County, between Lerdo and Delano, consisting of 20-foot asphalt concrete widening and resurfacing, are rapidly nearing completion. The asphalt concrete work is all completed and contractors' forces are now engaged in finishing roadway slopes and placing rock borders.

Improvement of the new maintenance yard site in the city of Delano is now in progress. When improvements have been completed, it is expected to sell the old site and either move the present foreman's cottage to the new site or build a new one.

On the Bakersfield-Freeman Highway, Weldon to the Walker Pass, 20 miles widening and alignment improvements are in progress, with a day-labor force of four 60- and 30-horsepower tractors with 8-foot and 12-foot graders and rotary scrapers. Preparations are being made for extending this work, Walker Pass to Freeman Junction, Route 23, distance 11 miles. Surveys nearly completed. These improvements will greatly add to the convenience of travel over the San Joaquin and Owens Valley cutoff. Preparations are in progress for the installation of a maintenance yard at Mojave including truck and oil sheds.

LAKE COUNTY—Two survey parties are now on location between Upper Lake and Williams. One party, located at Upper Lake, has been in the field for the past two months and is working between Upper Lake and Sweet Hollow Summit. The other was recently established at Wilbur Springs and will be on location east toward Williams.

LOS ANGELES COUNTY—In preparation for the reconstruction of a portion of Foothill boulevard, between Monrovia and Azusa, a contract has been let and is now nearly completed for the moving back of buildings to clear the way for the new hundred-foot boulevard.

The Southern California Edison Company has already moved back its power line, and work has been commenced on the moving back of private irrigation lines.

Work is nearly completed on the laying of over 21 miles of pipe line along the coast highway from the Los Angeles city limits west of Santa Monica to Nicolas Creek on the Malibu Ranch. The pipe line will carry water to be used for highway construction and maintenance work on the section of highway through the ranch.

At various points along the coast highway westerly from Santa Monica, the maintenance crew with trucks

equipped with hoists, is placing hundreds of tons of heavy rip rap rock to protect the highway embankment from the ocean waves.

Between Mariposa and Briceburg, reconstruction of existing roadway is being performed by convict labor. An average population of eighty convicts is being maintained in camp and two power shovels are being operated, a gas and steam. The construction force is now located about $3\frac{1}{2}$ miles north of Mariposa.

On the Yosemite lateral, the work of placing 6500 feet of standard laminated guard rail under contract is practically completed, the only remaining work being completion of painting.

MERCED COUNTY—The rock borders contract awarded to Larsen Bros. on the Pacheco Pass road from Los Banos to the easterly boundary is about 50 per cent complete. On this section, the Pacheco Pass route, approximately one mile east of the San Joaquin River, a multiple box culvert, consisting of six 10-foot spans was recently completed. This is for the purpose of by-passing flood waters which accumulate during the spring of each year and are prevented, with difficulty, from washing out the embankment and pavement.

Improvement of new maintenance yard site at Merced consisting of fencing, construction of warehouse, grading and graveling driveways, etc., is nearing completion.

MONO COUNTY—With the exception of installation of standard guard rail at dangerous points and maintenance patrol, there is no work under way in Mono County owing to below zero weather and periodical snow storms with attending cessation of travel. The snow fall on the "high Sierras" is much less than for many years past.

MONTEREY COUNTY—Work has been progressing steadily on the laying of a 20-foot concrete pavement from the northerly city limits of Salinas to the Santa Rita Junction, 1.9 miles north of the town. The pavement is being laid in half-sections, the east half having been completed and the west half started before the end of January.

Repair work is under way on the Carmel River bridge which is located on the highway to Big Sur just south of the town of Carmel. This work includes the reflooring of a considerable portion of the bridge.

ORANGE COUNTY—All concrete pavement has been completed and open to traffic on the 5.7-mile reconstruction job between Galivan and Irvine. Work is in progress on the rock borders along the new concrete pavement, with good progress being made.

The installation of pumps and a drainage system for the two new under-grade crossings of the Santa Fe Railroad tracks at Serra has been completed. Grading work is still in progress on the stretch of new highway which will connect the coast highway through Huntington Beach and Laguna with the Los Angeles to San Diego highway.

A special maintenance crew recently completed the construction of 2200 lineal feet of pipe and woven wire and brush bank protection work in the Santa Ana River, where flood waters threatened to cut away the approach to the highway bridge on the state highway between Anaheim and Santa Ana.

SAN LUIS OBISPO COUNTY—In connection with the program of curve betterment and minor line changes throughout San Luis Obispo County, a line change is being completed at a point about three miles north of San Luis Obispo, which will eliminate two of the sharper curves between San Luis Obispo and Cuesta Grade.

Work on the J. F. Knapp contract for reconstruction from Pismo to San Luis Obispo has thus far been confined principally to culvert work and grading,

which work is nearly completed on the south half of the job. On the Ontario Hill (located where the highway first reaches the Pacific Ocean) a considerable slide developed near the summit of the hill, where a heavy layer of shale rock is found to lie on a mass of very hard rock the upper surface of which was coated with a thin layer of asphalt and dirt, making a naturally lubricated surface for the upper material to slide upon.

One of the most dangerous curves on the Cholame lateral, located at the east end of the Cholame Creek bridge at Shandon pumping station, is being greatly improved by superelevating the curve and placing warning lights.

Two old wooden bridges near San Simeon, on the road which extends from Cambria toward Carmel, are being replaced by more adequate structures.

SANTA BARBARA COUNTY—The paving of the new highway through Summerland and over Ortega hill has recently been completed as an extension to the Sam Hunter contract. This highway, which was graded along a new line two years ago, as described in the February, 1926, issue of CALIFORNIA HIGHWAYS, has now been paved with a Portland cement concrete pavement 30 feet wide, joining continuously with the similar pavement recently completed by Contractor Hunter, from Carpinteria to Summerland.

Contractor Collins is installing rock borders between Orcutt and Zaca on the coast highway in the northern part of Santa Barbara County. The shoulder installation commenced at Orcutt and is now completed for a distance of about 6 miles to the south thereof.

SACRAMENTO COUNTY—The paving on the reconstruction work between Sylvan school and Roseville has been completed. Grades and lines were improved, the roadway widened and a 20-foot asphaltic concrete pavement six inches thick was placed as a reconstruction job. Where the old grade was followed the pavement was widened and thickened to conform to the new work. Rock shoulders and two-feet by four-inch rock borders are also being constructed. This latter work is well under way and will complete the job.

SAN DIEGO COUNTY—San Diego County is reconstructing a portion of the state highway between East San Diego and La Mesa, under state inspection. The cost of the work is to be shared by the county and the state.

Several narrow cuts on the highway in the vicinity of Jacumba were recently widened by the maintenance crew working under a special allotment, in order to make the highway safer for children going to and from school.

VENTURA COUNTY—The construction of nearly 600 feet of bank protection in the Santa Clara River, to prevent the washing away of the approach to the state highway bridge near Montalvo, has been completed.

A special maintenance crew working along the coast highway near Point Mugu is quarrying and placing thousands of tons of heavy rip rap rock to prevent the washing away of the highway embankment by the ocean waves.

Reckless driving, speeding and driving while intoxicated constituted $82\frac{1}{2}$ per cent of the offenses out of a total of 85,145 reported violations of the California Vehicle Act during 1927. The total number of these three offenses was 67,662 according to records of the State Motor Vehicle Division. Approximately 135,000 persons were fined, jailed or otherwise punished for motor vehicle violations during the year, the division estimates.

ROUGH GOING

STEP ON IT!

(An English auto racer in a specially designed sunbeam has recently hung up a world's record of 207 miles an hour. It took him four miles to stop his car. At the present rate of progress, may we hope for something like the following in 1975?):

"Mother, George and I are going out to a dance."

"All right, dear. Don't be late, will you?"

"No, Mother. The party's in San Francisco. We'll be back early."

(The Modern Girl of 1975 kisses her mother good-night and steps into her boy friend's 1200 horsepower runabout. He puts the car in low, and they thread through the traffic of lower New York at 40 miles an hour. Once in the country, George shifts to second speed and they ramble along at a comfortable 138 per.)

"Hadn't we better slow up, George? That sign back there said 'Danger: Sharp curve five miles ahead.'"

"That's all right, Joan. We have eight-wheel brakes. Well, here we are in Chicago!"

(He quickly adjusts the armor plate about his car, and they dash through the great city at 200 miles an hour, Joan manipulating the machine gun to ward off possible attacks.)

"Someone's trying to pass, George. He's been following us all through Iowa."

"Trying to pass, huh? Just let's see him do it!"

(With a whirl of gears, George shifts into fifth speed and shoots ahead like a comet. The other car follows suit. Milestones whiz past in a confused blur as the Juggernauts skim over the countryside, wheels scarcely touching the road.)

"George! Look out! Here's a railroad crossing."

"Good gosh! The fool engineer! He's trying to beat me across."

(George jams on his brakes, but it is too late. There is a terrific smash. On the far side of the track, George finally comes to a stop and turns around. The wrecked Pacific Coast Flyer lies in a tangled mass across the rails, cars telescoped and splintered by the frightful impact. Beside the track, by the grim irony of fate, stands the warning signal which would have prevented this terrible accident: "Stop, Look and Listen; Look Out for the Automobiles!")—*Badger Highways*.

"Where are you going, my pretty maid?"

"I'm going a-courtin', sir," she said.

"For yesterday morning on my way to school, I slipped and broke my traffic rule."

"There are four requisites to a good short story," explained the English teacher to the class. "Brevity, a reference to religion, some association with royalty and an illustration of modesty. Now, with these four things in mind, I will give you thirty minutes to write a story."

Ten minutes later the band of Sandy went up.

"That is fine, Sandy," she complimented, "and now read your story to the class."

Sandy read: "My Gawd," said the countess, 'take your hand off my knee.'"

The News and Critic, Laconia, prints this regarding a roadside notice posted in New Hampshire:

"By order of the selectmen, cows grazing by the roadside or riding bicycles on the sidewalks is hereby forbidden."

An arm protruding from the car ahead means that the driver is:

1. Knocking ashes off a cigarette.
2. Going to turn to the left.
3. Telling a small boy to shut up, he won't buy any red pop.
4. Going to turn to the right.
5. Pointing out a scenic spot.
6. Going to back up.
7. Feeling for rain.
8. Saluting a passing motorist, or going to stop.

—*Hardware Age*

January Record of Bids and Awards

DIVISION OF HIGHWAYS

AMADOR COUNTY—Timber bridge across Dry Creek about 2.3 miles west of Ione. Dist. III, Rt. 34, Sec. A. Engineer's est. \$7,896.70. Bids opened as follows: Holdener Construction Co., Sacramento, \$8,854.71; M. B. McGowan, San Francisco, \$12,517; M. A. Jenkins, Sacramento, \$10,107. Contract awarded to Holdener Const. Co.

ORANGE COUNTY—Building reinforced concrete girder bridge, 40-foot roadway, across Aliso Creek about 8 miles north of San Juan Capistrano; and widening existing reinforced concrete bridge 2 miles south of Tustin, to 40-foot roadway, Dist. VII, Rt. 2, Sec. B-C. Engineer's est. \$25,269.50. Bids opened Jan. 3d, as follows: A. R. Bishop, Long Beach, \$23,747.50; Allen Brothers, Inc., Los Angeles, \$24,811.20; Warren & Warren, Los Angeles, \$24,425.75; California Air Construction Co., Inc., Los Angeles, \$23,442.80; Oberg Bros., Los Angeles, \$27,002; R. L. Oakley, Palo Alto, \$23,972; Paul M. White, Santa Monica, \$21,971.30; R. Johnson, Glendale, \$23,380; Ignace P. Lipp, Hollywood, \$24,232. Contract awarded to Paul M. White, Santa Monica, \$21,971.30.

SAN LUIS OBISPO COUNTY—Foreman's maintenance cottage. Dist. V, Rt. 33, Sec. B. Engineer's est. \$3,150. Bids opened as follows: L. H. Carpenter of Paso Robles, \$3,089; E. D. Jarvis, Atascadero, \$3,575; James Jepson, San Luis Obispo, \$3,892; Peter Sorensen, San Francisco, \$3,383. Contract awarded to L. H. Carpenter.

DIVISION OF ARCHITECTURE

MENDOCINO STATE HOSPITAL—Tile roofing work. Bids opened Jan. 19th as follows: C. L. Frost, Monterey, \$3,084; W. H. Saxby, Oakland, \$3,100; R. E. Fraser & Co., Stockton, \$3,191; W. J. Porter, San Jose, \$3,298; Eckhardt & Ferrabee, Oakland, \$3,325; Homer H. Sosso, San Francisco, \$3,445; Malott & Peterson, San Francisco, \$3,675. Contract awarded to C. L. Frost, Monterey, \$3,084.

PACIFIC COLONY (Spadra)—Plumbing and heating work on employees' buildings and garages. Bids opened Jan. 24th as follows: Office estimate, \$10,617; Jones Heating Co., Pasadena, \$8,812; W. P. McArthur, Los Angeles, \$9,508; Hickman Bros., Inc., San Pedro, \$9,576; Latourrette-Fical Co., Sacramento, \$9,816; Walter H. Smith, Long Beach, \$9,950;

Thomas Haverty Co., Los Angeles, \$11,467. Contract awarded to Jones Heating Co., Pasadena, \$8,812.

For electrical work on employees' buildings and garages. Bids opened Jan. 24th as follows: Office estimate, \$1,875. Moore Electrical Co., Los Angeles, \$1,830; American Electrical Construction Co., Los Angeles, \$1,879; R. R. Jones Electric Co., South Pasadena, \$2,066; R. B. Winder, Covina, \$2,079; Walter H. Smith, Long Beach, \$2,385. Contract awarded to Moore Electric Co., \$1,830.

For general work on employee's building and garages. Bids opened Jan. 24th as follows: Office estimate, \$47,054. Campbell Construction Co., Ontario, \$36,250; A. A. Laisy & Co., Los Angeles, \$38,770; Gene B. Foster, Los Angeles, \$39,611; Johnson Construction Co., Los Angeles, \$39,690; Pozzo Construction Co., Los Angeles, \$41,492; Wm. Rohrbacher, Santa Ana, \$41,685; MacDonald & Driver, Los Angeles, \$41,989; J. F. Kobler, Los Angeles, \$41,989; Geo. Herz Co., San Bernardino, \$42,100; V. Ray Gould, Los Angeles, \$42,146; John Strona, Pomona, \$42,250; Blue Ribbon Builders, Ontario, \$42,898; John H. Kuhl, Jr., Beverly Hills, \$42,962; Nance & Strauser, Sawtelle, \$44,857; Louis A. Geisler, Huntington Park, \$45,778; Fred F. Greenfield, Los Angeles, \$45,918; Walter Slater Co., Los Angeles, \$51,133; Witt & Chute, Los Angeles, \$42,988. Contract awarded to Campbell Construction Co., Ontario, \$36,250.

WATER PERMITS AND APPLICATIONS

Permits

Permits to appropriate water issued by the Department of Public Works, Division of Water Rights, during the month of January, 1928:

EL DORADO COUNTY—Permit 2950, Application 5659; issued to Carl W. Schmidt, Piedmont, January 16, 1928, for 0.001 c.f.s. from Celeste Creek in section 22, T. 12 N., R. 17 E., for domestic purposes in section 14. Estimated cost \$150.

Permit 2946, Application 5682; issued to U. S. Forest Service, Placerville, January 12, 1928, for 0.005 c.f.s. from Alder Creek in section 35, T. 11 N., R. 14 E., for domestic purposes. Estimated cost \$250.

LAKE COUNTY—Permit 2953, Application 4788; issued to Snow Mountain Water and Power Corporation, San Francisco, January 20, 1928, for 400 c.f.s. and 214.813 acre-feet per annum from South Eel River in section 14, T. 18 N., R. 10 W., for power purposes, 21681 t.h.p. to be developed. Estimated cost \$3,200,000.

Permit 2954, Application 5661; issued to Snow Mountain Water and Power Corporation, San Francisco, January 20, 1928, for 4500 acre-feet per annum from South Eel River in section 14, T. 18 N., R. 10 W., for irrigation of 4905.9 acres within Potter Valley Irrigation District. Estimated cost \$100,000.

LOS ANGELES COUNTY—Permit 2949, Application 5544; issued to Chas. A. Caldwell, Llano, January 16, 1928, for 0.007 c.f.s. from unnamed spring in section 25, T. 4 N., R. 9 W., S. B. M., for domestic purposes in section 24. Estimated cost \$1,000.

Permit 2958, Application 5558; issued to Frank A. Hickman, San Dimas, January 30, 1928, for 0.12 c.f.s. from waste and seepage water from headwaters of Walnut Creek in section 2, T. 1 S., R. 9 W., for irrigation of 10 acres in section 2.

PLACER COUNTY—Permit 2955, Application 5413; issued to T. M. Navas, Auburn, January 21, 1928, for 0.19 c.f.s. from Buckeye Ravine in section 36, T. 12 N., R. 7 E., for domestic purposes and irrigation on 15 acres in section 36. Estimated cost \$800.

RIVERSIDE COUNTY—Permit 2951, Application 5477; issued to U. S. Forest Service, San Bernardino, January 19, 1928, for 0.025 c.f.s. from unnamed spring in section 26, T. 4 S., R. 2 E., for domestic purposes in section 26. Estimated cost \$500.

Permit 2952, Application 5758; issued to U. S. Forest Service, San Bernardino, January 19, 1928, for 0.016 c.f.s. from two unnamed springs in section 18, T. 5 S., R. 3 E., for domestic purposes in section 18. Estimated cost \$1,600.

SAN BERNARDINO COUNTY—Permit 2945, Application 4483; issued to U. S. Forest Service, San Bernardino, January 12, 1928, for 0.11 c.f.s. from two unnamed springs and two wells in sections 29, 30, 19, T. 2 N., R. 3 W., for domestic purposes. Estimated cost \$30,000.

Permit 2947, Application 5709; issued to H. B. Martin, Los Angeles, January 13, 1928, for 0.22 c.f.s. from a tunnel in section 28, T. 8 N., R. 18 E., for mining and domestic purposes near point of diversion. Estimated cost \$500.

Permit 2948, Application 5436; issued to Isaac M. McAllister, Phelan, January 13, 1928, for 1.81 c.f.s. from Wild Horse Canyon in section 26, T. 4 N., R. 7 W., for irrigation and domestic purposes on 145 acres. Estimated cost \$20,000.

SANTA CRUZ COUNTY—Permit 2944, Application 5689; issued to C. A. Doss, trustee for Bracken Brea Country Club, Oakland, January 11, 1928, for 0.025 c.f.s. from West Fork Sand Creek in section 24, T. 9 S., R. 3 W., M. D., for domestic purposes. Estimated cost \$500.

SISKIYOU COUNTY—Permit 2956, Application 5476; issued to B. F. Whitton, Berkeley, January 21, 1928, for 1 c.f.s. from unnamed spring in section 15, T. 39 N., R. 8 W., for power purposes in section 15. 68 t.h.p. to be developed. Estimated cost \$500.

TULARE COUNTY—Permit 2943, Application 5546; issued to R. Linder, Tulare, January 11, 1928, for 0.035 c.f.s. from Nelson Creek in section 28, T. 20 S., R. 31 E., for domestic purposes in section 33. Estimated cost \$1,250.

TUOLUMNE COUNTY—Permit 2957, Application 5414; issued to Emma Rose and Hobart Estate Co., San Francisco, January 24, 1928, for 4656 acre-feet per annum from Highland Creek in section 9, T. 6 N., R. 18 E., for power purposes. 3294 t.h.p. to be developed.

Applications

Applications for permit to appropriate water filed with the State Department of Public Works, Division of Water Rights, during the month of January, 1928.

ALAMEDA COUNTY—Application 5811; The West Oakland Home, Oakland, for 0.3 c.f.s. from Crow Canyon Surface and underflow tributary to San Lorenzo Creek, to be diverted in section 25, T. 2 S., R. 2 W., M. D. M., for domestic and recreational purposes. Estimated cost \$2,500.

CALAVERAS COUNTY—Application 5803; Pioneer Chief Gold Mines Co., San Andreas, for 0.625 c.f.s. from South Fork of Calaveras River tributary to Calaveras River, to be diverted in section 32, T. 4 N., R. 12 E., M. D. M., for mining purposes near point of diversion. Estimated cost \$2,000.

DEL NORTE COUNTY—Application 5808; Wm. F. Cook and Frank Pitts, Crescent City, for 0.5 c.f.s. from unnamed spring tributary to Middle Fork of Smith River, to be diverted in section 28, T. 17 N., R. 2 E., H. M., for domestic purposes. Estimated cost \$500.

FRESNO COUNTY—Application 5788; Miller & Lux, Inc., San Francisco, for 735 c.f.s. from San Joaquin River, to be diverted in section 19, T. 13 S., R. 15 E., M. D. M., for irrigation purposes on 58,796 acres. Estimated cost \$294,000.

KERN COUNTY—Application 5797; Trona Railway Co., Trona, for 0.01 c.f.s. from Searles Tunnel, to be diverted in section 21, T. 28 S., R. 40 E., M. D. M., for industrial and domestic purposes. Estimated cost \$11,269.

LAKE COUNTY—Application 5798; Mirabel Park Association, Oakland, for 3 c.f.s. from St Helena, Grizzly and Plymouth creeks tributary to Putah Creek, to be diverted in section 23, T. 10 N., R. 7 W., M. D. M., for mining purposes in section 23. Estimated cost \$4,000.

Application 5799; Mirabel Park Association, Oakland, for 3 c.f.s. and 200 acre-feet from Bradford Creek tributary to Putah Creek, to be diverted in section 27, T. 10 N., R. 7 W., for power purposes in section 27. 10 t.h.p. to be developed. Estimated cost \$15,000.

Application 5800; Mirabel Park Association, Oakland, for 0.20 c.f.s. and 200 acre-feet per annum from Bradford Creek tributary to Putah Creek, to be diverted in section 27, T. 10 N., R. 7 W., M. D. M., for domestic, irrigation and recreational purposes in sections 14 and 23 on 100 acres. Estimated cost \$5,000.

LASSEN COUNTY—Application 5812; G. L. Kramer, Bieber, for 6.75 c.f.s. and 350 acre-feet from Widow Valley Creek tributary to Pit River, to be diverted in section 31, T. 39 N., R. 7 E., section 31, T. 38 N., R. 7 E., for irrigation purposes on 540 acres. Estimated cost \$3,000.

LOS ANGELES COUNTY—Application 5802; Wm. E. Daly, Newhall, for 0.25 c.f.s. from unnamed spring in Canton Canyon tributary to Piru Creek, to be diverted in section 21, T. 6 N., R. 17 W., S. B. M., for domestic purposes at service station. Estimated cost \$600.

Application 5813; Grand P. Ealy, Los Angeles, for 0.025 c.f.s. from springs at head of Breakneck Canyon, to be diverted in section 1, T. 2 N., R. 13 W., for domestic purposes.

Application 5805; Joseph Reynier, Newhall, for 0.25 c.f.s. from a spring known as Reynier Spring tributary to Santa Clara River, to be diverted in section 11, T. 3 N., R. 15 W., S. B. M., for domestic purposes. Estimated cost \$2,500.

MADERA COUNTY—Application 5789; Miller & Lux, Inc., San Francisco, for 277 c.f.s. from San Joaquin River, to be diverted in section 22, T. 13 S., R. 16 E., M. D. M., for irrigation purposes on 22,170 acres. Estimated cost \$75,000.

Application 5790; Miller & Lux, Inc., San Francisco, for 175 c.f.s. from San Joaquin River to be diverted in section 8, T. 13 S., R. 17 E., M. D. M., for irrigation purposes on 14,238 acres. Estimated cost \$131,750.

MODOC COUNTY—Application 5792; Red River Lumber Co., Westwood, for 55 c.f.s. from Ash Creek tributary to Pit River, to be diverted in section 4, T. 38 N., R. 10 E., M. D. M., for power purposes in section 19, T. 39 N., R. 10 E. 3435 t.h.p. to be developed. Estimated cost \$250,000.

Application 5804; A. R. Conklin, Alturas, for 0.625

c.f.s. from Dry Creek tributary to Parker Creek, to be diverted in section 2, T. 42 N., R. 14 E., M. D. M., for irrigation and domestic purposes on 72 acres.

Application 5795; John P. Booth, San Jose, for 30 c.f.s. and 5500 acre-feet per annum from Mill Creek and South Fork of Pit River tributary to Pit River, to be diverted in section 28, T. 40 N., R. 15 E., section 10, T. 39 N., R. 14 E., M. D. M., for power purposes. 1085 t.h.p. to be developed.

PLACER COUNTY—Application 5806; F. C. Bock, Loomis, for 0.62 c.f.s. from Antelope Creek tributary to Linda Creek, to be diverted in section 5, T. 11 N., R. 7 E., M. D. M., for irrigation and domestic purposes on 50 acres. Estimated cost \$225.

SACRAMENTO COUNTY—Application 5801; T. Giraud, Rio Linda, for 0.19 c.f.s. from Dry Creek tributary to Sacramento River, to be diverted in section 33, T. 10 N., R. 5 E., for irrigation purposes on 15 acres.

SAN BERNARDINO COUNTY—Application 5791; U. S. Forest Service, San Bernardino, for 0.01 c.f.s. from unnamed spring tributary to Coldwater Creek and North Fork Lytle Creek, to be diverted in NW $\frac{1}{4}$ NE $\frac{1}{4}$ section 10, T. 2 N., R. 7 W., S. B. M., for domestic purposes on Pine Flats Resort Site. Estimated cost \$200.

Application 5793; Horace M. Dobbins, Los Angeles, for 0.25 c.f.s. from an unnamed branch of Lone Pine Canyon tributary to Cajon Creek, to be diverted in section 10, T. 2 N., R. 6 W., S. B. M., for irrigation and domestic purposes on 90 acres. Estimated cost \$2,000.

SAN DIEGO COUNTY—Application 5794; Chas. E. Ingraham, Buena Park, for 0.5 c.f.s. from two springs tributary to Mountain Springs, to be diverted in section 25, T. 9 S., R. 3 W., S. B. M., for domestic and irrigation purposes on 80 acres.

SAN JOAQUIN COUNTY—Application 5807; Woodbridge Irrigation District, Stockton, for 500 c.f.s. from Mokelumne River tributary to San Joaquin River to be diverted in section 34, T. 4 N., R. 6 E., M. D. M., for irrigation purposes on 35,000 acres. Estimated cost 325,000.

SAN LUIS OBISPO COUNTY—Application 5815; Marland Oil Co., Los Angeles, for 0.078 c.f.s. from Nacimiento River tributary to Salinas River, to be diverted in section 4, T. 25 S., R. 11 E., M. D. M., for mining purposes for boiler plant drilling for crude petroleum oil and domestic use. Estimated cost \$3,200.

SHASTA COUNTY—Application 5796; Chas. F. Dougherty, Hazel Creek, for 0.019 c.f.s. from unnamed mineral spring tributary to Big Salt Creek, to be diverted in section 22, T. 35 N., R. 4 W., M. D. M., for medicinal, recreational and industrial purposes. Estimated cost \$500.

SISKIYOU COUNTY—Application 5814; Herman Hageborn, Montague, for 2 c.f.s. from Trout Creek, to be diverted in section 32, T. 42 N., R. 1 E., for irrigation and domestic purposes on 100 acres. Estimated cost \$150.

TRINITY COUNTY—Application 5810; Buckeye Placer Mines, Inc., Woodland, for 15 c.f.s. from Buckeye Creek tributary to Trinity River, to be diverted in section 24, T. 37 N., R. 8 W., M. D. M., for hydraulic mining purposes. Estimated cost \$6,000.

VENTURA COUNTY—Application 5809; Otto G. Wilhelm, Los Angeles, for 0.5 c.f.s. from Santa Ana Creek tributary to Ventura River, to be diverted in section 7, T. 4 N., R. 23 W., S. B. M., for irrigation and domestic purposes on 170 acres. Estimated cost \$38,000.

ROSTER
DEPARTMENT OF PUBLIC WORKS
STATE OF CALIFORNIA

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B. B. MEEK, Director, Department of Public Works

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CALIFORNIA

1. Cuesta Grade, San Luis Obispo County.
2. Fifty-six-foot pavement on state highway near Tustin, Orange County.
3. Bridge across Crystal Dam, Skyline boulevard, San Mateo County.
4. State highway between San Juan and Hollister, San Benito County.
5. Pacheco Pass road near old Gilroy, Santa Clara County.
6. Shepards bridge, foot of Mountain Springs grade, Imperial County.
7. State highway near San Jose, Santa Clara County.
8. Pedestrian bridge over state highway, Coast road, north of Santa Monica, Los Angeles County.
9. State highway near Bear Canyon, Santa Cruz road, Santa Cruz County.
10. Rincon sea wall, Coast road, Ventura County.

HIGHWAYS



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California Highways and Public Works

Official Journal of the Department of Public Works
State of California

GLASSOM TIME
LONG A STATE
HIGHWAY IN THE
SANTA CLARA
VALLEY



APRIL 1928

191928



A PALM-LINED STATE HIGHWAY IN SOUTHERN CALIFORNIA

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A FLOWER-LINED STATE HIGHWAY IN NORTHERN CALIFORNIA

To the honored memory of AUSTIN B. FLETCHER

State Highway Engineer of California
from 1911 to 1923, this issue of California Highways
and Public Works is dedicated



he task of pioneering the development of California's highway system was the work that fell to the lot of "A. B." Into these early roads, he built not only tested cement and proven asphalt, well wrought steel and good macadam; but more permanent and enduring than aggregate and metal, were his fine ideals of honest, able and efficient public service, which also became an integral part of the highways, forming a foundation upon which the present roads of California are the superstructure.

Mr. Fletcher lived to see the tree of his life-mature and fruit in an added happiness and an enlarged usefulness given to the whole people of California. What greater monument could any one build? What greater reward could any one ask?

Austin B. Fletcher, Highway Builder

By C. C. CARLETON, Chief of the Division of Contracts and Rights of Way, State Department of Public Works.

EASTERN dispatches on March 8th announced the passing of one of the most notable highway engineers of our time—Austin Bradstreet Fletcher, first State Highway Engineer of California.

Perhaps no modern road builder has a more impressive record of achievement than he. Certainly none has more greatly influenced the thoughts and methods of his associates and contemporaries.

Mr. Fletcher was born at Cambridge Massachusetts, fifty-six years ago. He was educated at Harvard University. From 1893 to 1910 he was secretary and executive officer of the Massachusetts Highway Commission which was considered a model in highway practices in the United States. In 1910 he was chosen as secretary-engineer for the San Diego County, California, Highway Commission after a careful consideration of the outstanding road engineers of America. In 1911 he was selected by Governor Hiram W. Johnson to head the first State Highway Department of the State of California, in which capacity he served until 1923. During this period he also served as Director of Public Works and President of the State Reclamation Board. Since 1923 he has occupied a responsible position as Consulting Engineer for the United States Bureau of Public Roads at Washington, D. C., which was his official residence at the time of his death.

Mr. Fletcher was particularly recognized as a great organizer and an adept in the selection of personnel. He had extraordinary discernment in his analyses of the character, qualifications and integrity of applicants for positions at his disposal.

It became his duty to assemble the initial engineering field forces at the commencement of state highway activities in California in 1911, and from the outset he endowed it with an esprit de corps which has probably been unequalled in any similar organization.

It is a remarkable fact that today, in 1928, every district engineer and practically every department head of the California Highway Commission has been brought into the organization and trained and developed by him. A host of others in public employment everywhere have been the beneficiaries of his tutelage.

It may be safely stated that no public executive in California ever had a more loyal and devoted staff than he during his long

tenure of the position of State Highway Engineer of California. His co-workers prized it as a privilege and a distinction to labor under so precise, systematic and cultured a friend and leader as Mr. Fletcher: indeed, from him they received a liberal education in the proper forms, niceties and methods of business management and engineering practice.

Mr. Fletcher was called to California because of his widespread reputation as a road builder and because he was considered big enough to establish precedents rather than to follow in the footsteps of other men. So well did he install system in California that few changes have been made or perhaps can be made in the engineering principles and standards devised by this far-seeing pioneer of highway development. His ideas and ideals will ever remain foundation stones of the organization structure of the State Highway Department of California.

He was a strict disciplinarian but tempered his discipline with such kindness and consideration that few stings were ever left and but few subordinates took umbrage at his endeavor, as he humorously expressed it, "to keep them in their own corrals."

To many who did not truly know him Mr. Fletcher was considered somewhat austere and aristocratic. He was a man of quiet dignity, worthy ancestry and scholarly accomplishments, and by some he was misjudged and by others misrepresented.

But to those who really knew him his human and engaging qualities were predominant and they feel a profound personal grief at his taking.

The writer first met Mr. Fletcher when he arrived in San Diego to undertake the construction of the first county highway system of San Diego County nearly two-score years ago.

He was then spoken of as a "typical" New Englander personifying the manners, culture and traditions of the east.

But he was to become a pathfinder in road building in the west. Western ways were new to him at first, but in the years to follow he adjusted himself to his surroundings and the closing statement may be safely ventured that could he now express himself he would prefer to be borne in mind by his friends in the west as a gentleman and a Californian.

How the State Highway Forces Met Emergency Following Dam Disaster

DAMAGE estimated at \$150,000 was suffered by the California highway system when the St. Francis dam failed at midnight on March 12th. Of this damage, however, approximately \$70,000 was represented in a bridge over the Santa Clara River, the replacement of which at another site had already been decided upon. The net damage to the state highway system, accordingly will be about \$80,000.

The flood placed a threefold responsibility upon representatives of the Division of Highways. The failure of the dam occurred at 11.58 p.m. At 2 a.m. Maintenance Foreman L. B. Prosper was notified at the El Rio maintenance station of the collapse of the structure and that a great flood was rushing down the channel of the Santa Clara River.

Mr. Prosper immediately summoned his crew and stationed men at either side of the bridge crossing the Santa Clara River to warn motorists of the coming danger and to throw barricades across the road.

This was the first task to be performed. A number of lives were undoubtedly saved by the efforts of the highway crew. The story is told, however, of one machine that refused to stop, apparently fearing a possible hold-up.

Second came the duty of assisting in rescue work.

Third came the task of reestablishing communication into the flooded area that relief work might be facilitated.

In all three tasks members of the Division of Highways did their part ably and well,

reflecting credit upon themselves and honor upon the Department of Public Works.

FLOOD HITS MAINTENANCE STATION

Mr. Prosper was patrolling the Santa Clara bridge when the rush of the flood first became audible. Fearing for safety of his wife in the maintenance cottage, he rushed to her aid. They drove east in their car just as a four-foot wall of water struck the El Rio

maintenance yard. This yard is located nearly a half mile from the east end of the Santa Clara River bridge.

Mud and debris were deposited everywhere over the maintenance yard. Road equipment was buried hub-deep in mud. Water filled the cellar of the cottage and soon flooded the interior of the house. Damage of the maintenance yard is estimated at \$2,000.

Between the maintenance yard and El Rio, about 3000 feet to the east, flood water crossed the highway depositing mud and debris on the pavement. The Santa Clara channel, over 2000 feet wide,

was filled to overflowing. The main force of the flood struck the west end of the bridge.

TETRAHEDRONS DEFLECT WATER

Standing directly in the path of the torrent a row of thirty tetrahedrons extended out from the river bank. These were struck by a wall of water 15 feet high.

This wall of water carried with it a mass of large, uprooted trees, telephone and power poles, portions of buildings and barns which had been destroyed by the flood, and this

COMMENDATION IS GIVEN TO HIGHWAY EMPLOYEES

By B. B. MEEK, Director of the Department of Public Works.

I AM most gratified at the prompt and intelligent manner in which District Engineer Cortelyou and the men associated with him in every capacity met the emergency that arose from the flood which followed the collapse of the St. Francis Dam.

Persons most closely associated with rescue and relief work have informed me that the early reestablishment of communication in the flooded area made possible by highway forces was a most important factor in their work.

While the destruction of life and property in this disaster occasions the deepest sorrow, yet it is good to know that in time of stress and danger the state has in its employment men of clear thought and quick action, men to whom the call of duty takes precedence over personal safety, and who have no regard for hours of labor when difficult tasks are to be performed.

The thanks of the Department of Public Works is due all of the men who labored so fearlessly and so arduously in the days and nights following this great disaster. It is this spirit that has made the Division of Highways of the State of California known and respected the nation over.

battering ram was at work for several hours in its attack on the westerly approaches of the highway and railroad bridges. The force of the rushing waters was so tremendous that the entire row of thirty tetrahedrons, weighing over 200 tons and laced together with seven lines of inch cable, was swung back a



Where the Santa Clara bridge was swept away.

hundred and fifty feet toward the river bank at the downstream end, pivoting about the heavy concrete anchor at the bank on the upstream end, which held firm.

The earth approach to the west end of the Santa Clara bridge was not damaged, the water being



The bridge three hundred feet down stream.

deflected by the tetrahedrons. The flood, however, topped the bridge floor by a foot and carried away 240 feet of the bridge and all of the concrete pile bents supporting it. A hundred feet or more of the bridge deck was thrown high on the west river bank where it lays intact over 300 feet from where it was displaced.



Section of pavement in the flooded area.

BANK PROTECTION HAS SEVERE TEST

It is worthy of note that this recently completed bank protection at the west end of the Santa Clara River state highway bridge near Montalvo in Ventura County, though damaged and badly displaced by the terrific flood, proved effective and prevented a damage to the state highway, to the Southern Pacific Railroad and to the abutting property, which, without this protection, would have been many times the original cost of the bank protection.

Except for the line of defense made by these reinforced concrete tetrahedrons, the rushing flood waters would have washed away many acres of fertile ground on the west bank of the river; would have washed away the earth embankments at the west end of the



Tetrahedrons thrown into the bank.

state highway bridge and of the bridge on the main "Coast line" of the Southern Pacific Railroad.

DISTRICT ENGINEER ON JOB

District Engineer Cortelyou was informed early Tuesday morning of the disaster and left immediately for Saugus. Field investigations quickly showed that the 200-foot steel truss span over the Santa Clara River had been entirely washed out. He immediately instructed his assistant to engage a pile driver and crew. Before leaving Los Angeles he communicated with Chas. E. Andrew, bridge engineer, who was in Los Angeles at the time. Mr. Andrew left immediately for the scene of the disaster to assist in bridge opera-



The temporary bridge.

tions there. District Maintenance Engineer I. S. Voorhees and Assistant District Maintenance Engineer E. T. Scott were also with Mr. Cortelyou.

Inasmuch as the Newhall alternate line contemplates the abandonment of the narrow steel truss span over the Santa Clara River and the construction of a wider bridge several hundred feet up stream with

(Continued on page 22.)

California's Message to Arizona

State Highway Commissioner Baumgartner Pleads for the Unity that Is Particularly Denoted in Bridges

The Department of Public Works and the Division of Highways was represented at the dedication of the Mecca-Blythe bridge on March 10, by J. P. Baumgartner, State Highway Commissioner. Mr. Baumgartner's address on that occasion follows:

IT IS with sincere pleasure and feeling of honor that I bring you the greetings, compliments and congratulations of the Department of Public Works and the Division of Highways of the State of California. In doing so I speak personally for Mr. B. B. Meek, the Director of Public Works, whose special representative I have the honor to be on this occasion. I have also been asked to represent personally and bring you the personal greetings of my colleagues on the California Highway Commission, Mr. Ralph W. Bull of Eureka, Senator M. B. Harris of Fresno, Mr. Fred S. Moody of San Francisco and Mr. Joseph M. Schenck of Los Angeles.

We have all looked upon this occasion as of great importance and significance. We regard this bridge as not only a physical link between the two great commonwealths of Arizona and California, but as a spiritual joining of our common interests and destinies. We indulge fondly in the hope that it will prove to be so. The only fly in the ointment is that the only California state highway leading directly to this bridge stops four miles east of it, and that the bridge was not built by Arizona and California as it should have been. I feel that I can promise that the California state highway will soon be extended east to the entrance of the bridge, and that I am justified in the prediction that, in the fullness of time, this and all other toll bridges and toll roads in California and Arizona will become state property and free to all traffic.

Arizona, as well as California, is an empire in itself; like California, is so vast in resources and territorial extent that its people know California and Californians know its people to a very limited extent. If I may be pardoned for what may seem, but is not intended to be, the sounding of a discordant note, I will venture the prediction that if the people of California and those of Arizona knew each other better we would not now be struggling against each other in a vitally

important matter in which we should be in full accord. And I believe I am not unduly optimistic in expressing the belief that in this matter and in all others wherein our destinies are or may be joined we shall soon come to be a civically and morally, as we are now an economically, united people of the great Pacific Southwest.

It would seem to be not unfitting for me to call the attention of those here assembled, especially those from Arizona, to the fact that California has planned to spend during the next two years very close to a half million dollars on the improvement of roads leading to this bridge. Our hope is that Arizona will not only meet us here and at all points and kinds of contact with good will and good intentions, but also at the earliest possible moment, at this point at least, with good roads. In this connection, I am not unmindful of the fact that in some of our interstate connections Arizona puts California to shame. I am happy to assure Arizona, and California as well, that definite plans have been made and money has been budgeted for improving, very soon and very materially, *all* of our interstate connections on the California side.

California's state road-building program contemplates the expenditure during the ensuing biennium of very close to fifty million dollars in reconstruction, new construction and maintenance of roads; and the work to be done during the same period by the counties of California will bring the state's total investment in roads for the biennium up to about one hundred and sixty million dollars.

To my way of thinking, a bridge like this is a marvelous thing. I like to think of life in terms of bridges. Bridges connote connections, not severance. They mean easy, safe and economical intercommunication. They are socially and morally constructive as well as industrially and commercially so. They provide that vital thing we call contact—not physical contact alone, but the finer contact that produces the spiritual spark. And bridges mean beauty. At least some of them do and all of them should. It is almost a crime to build an ugly bridge, especially in California or Arizona, where most bridge settings are so beautiful. Our bridges should

(Continued on page 25.)

Text of the Report to Governor Young on Causes of St. Francis Dam Failure

THE COMPLETE text of the report submitted to Governor Young by the Board of Inquiry appointed by him to investigate the causes leading to the failure of the St. Francis Dam at midnight on March 12th is herewith printed. The report represents the unanimous opinion of the engineers and geologists comprising the Board of Inquiry. In receiving the report Governor Young called public attention to the fact that the members of the board, comprising some of the most eminent engineers and scientists of the nation, had served without compensation, thus placing their report, in the words of Governor Young, "upon an exceptionally high plane of public service." Members of the Board of Inquiry were: A. J. Wiley, chairman, Consulting Engineer, Boise, Idaho; Geo. D. Louderback, Professor of Geology, University of California, Berkeley; F. L. Ransome, Professor of Economic Geology, California Institute of Technology, Pasadena; F. E. Bonner, District Engineer, U. S. Forest Service, and California Representative Federal Power Commission, San Francisco; H. T. Cory, Consulting Engineer, Los Angeles; F. H. Fowler, Consulting Engineer, San Francisco. The report follows:

Los Angeles, California,

March 24, 1928.

The Honorable C. C. Young,

Governor of California,

Executive Offices,

Sacramento, California.

SIR: Your commission to investigate the causes leading to the failure of the St. Francis Dam assembled in Los Angeles on the morning of March 19, 1928, and was met at the state offices by Mr. Bert B. Meek, Director of Public Works, and Mr. Edward Hyatt, State Engineer. The initial session of the commission was called to order by Mr. Meek as your personal representative, who delivered your instructions as follows:

"Not only California, but all the nation, has been appalled by the dreadful calamity which has befallen the beautiful little Santa Clara River Valley in Los Angeles and Ventura counties. This is a matter in which there are obviously three parties at interest—the stricken area of the two counties, the city of Los Angeles and the public at large. All of these are obviously equally anxious to learn all of the facts connected with this disaster.

I accordingly feel that it is a duty of the state to assemble a commission of eminent engineers and scientists to investigate the causes leading to the failure of the St. Francis Dam.

The prosperity of California is largely tied up with the storage of its flood waters. We must have reservoirs in which to store these waters if the state is to grow. We can not have reservoirs without dams.

These dams must be made safe for the people living below them. All this is both elemental and fundamental.

Accordingly our duty is a double one. We must learn, if it is possible, just what caused the failure of the St. Francis Dam; the lesson that it teaches must be incorporated into the construction of future dams. There must be no repetition of this catastrophe if it is humanly possible to prevent it."

Guided by such instructions, the commission has carried out its investigations in field and office. Mr. Meek and Mr. Hyatt have held themselves constantly available for consultation and aid, and it is only through their assistance that the commission has been able to complete its work within such a limited time.

Through the cooperation of Mr. Wm. Mulholland, chief engineer and general manager of the Bureau of Water Works and Supply, city of Los Angeles, your commission has been furnished plans, photographs and other data concerning the design, construction and operation of the St. Francis Dam. These data include the results of certain measurements and surveys made after the disaster.

Independent surveys and measurements were made for the commission by the forces under Mr. S. V. Cortelyou, District Engineer of the California Highway Commission. The state highway force also secured all test specimens selected by your commission, and preparation and testing of the specimens were



Upper left, The St. Francis reservoir before the collapse of the dam. Lower left, Scene at the dam site following the failure of the structure. Note the portion of the dam left standing and the white markings on the stream bed which denote the height that the water reached as it rushed down the stream. Upper right, Scene at brow of west wing showing cross-sections of formation upon which dam was built.

carried out under the direction of Mr. W. A. Perkins, hydraulic engineer of the State Engineer's office. Mr. Perkins also prepared the table of discharge deduced from the chart made by the water register on top of the dam.

Geological conditions at the dam site have been the subject of careful study by Dr. George D. Louderback, and by Dr. F. L. Ramsome, members of the commission.

DESCRIPTION OF ST. FRANCIS DAM

Construction of the dam was begun in April, 1924, and the structure completed May 4, 1926. It was located on San Francisquito Creek in section 1, T. 5 N., R. 16 W., San Bernardino meridian, between San Francisquito Power House No. 1 (upstream) and Power House No. 2 (downstream). The reservoir created by the dam was primarily for terminal storage near the lower end of the Los Angeles Aqueduct which conveys water from the Owens River region. Incidentally it was expected ultimately to catch the run-off from the San Francisquito Creek drainage area above it, of approximately 37 square miles. Legal rights to do this, however, had not been secured, and it is understood that such local waters were passed through the reservoir. The drainage area

above the dam, and the location of the Los Angeles Aqueduct and power plants with relation to the streams, highways, etc., are shown on the map. A profile of the nearby portion of the aqueduct, including the St. Francis Dam and reservoir, is shown. It will be observed that water which passed to St. Francis reservoir could not be utilized through Power House No. 2.

The dam was of the solid gravity type, curved on a radius of 500 feet to the upstream face at the crest. Its right or westerly end was continued by a wing wall which followed in general the crest of a narrow ridge, finally terminating at a high point about 500 feet from the end of the main dam; a small gap beyond this point was closed by a low concrete wall. The maximum cross-section, and a plan of the dam (including wing walls, etc.) Maps and plans furnished by the Bureau of Water Works and Supply show that the crest thickness of the dam was 16 feet, and the maximum section was 205 feet high and 175 feet thick at the base. The batter of the upstream face changed from 1 in 27 to 1 in 10, and finally in the extreme bottom to $3\frac{1}{2}$ in 10. The downstream face was carried up in a series of steps uniformly 5 feet high, and with widths varying from 5.5 feet near the bottom to 1.45 feet near the top. The length of the main dam measured along the center line of

(Continued on page 25.)

Solving San Francisco's Road Problems

By J. H. SKEGGS, District Engineer, San Francisco.

THE first unit of the state's portion of the Bayshore is now being advertised. It is the section from San Francisco to South San Francisco on new alignment and grades and consists of heavy grading with temporary surfacing pending settlement, the cost of the 4.36 miles to run well over a half million dollars.

The second section, South San Francisco to Broadway Station, Burlingame, as graded in 1926 by D. R. Foley and Company, has been in an unsurfaced condition. Since the South San Francisco underpass is completed a contract was let in December to Granfield, Farrar and Carlin for regrading and surfacing with rock. This job is well under way, the grading nearly completed and the rocking well started.



J. H. SKEGGS.

Rains have been the deciding factor on this job as on account of the material used in subgrade, in wet weather heavy trucks can not work. With the laying of rock this is overcome and it is expected that the job will proceed at a fast rate. Upon completion of rock surfacing a final surface of oil treatment of a bituminized macadam will be placed before opening to traffic.

REALIZATION OF LONG DREAM

The third section from Broadway Station, Burlingame to Fifth avenue, San Mateo, is to be advertised in the near future and it can be said that the dream of years, a wide road with easy grades to relieve the Peninsula highway and accommodate the expected heavy trucking to the new industrial sites along the water front, is no longer merely a dream but well on its way to realization.

THE BROKEN BOTTLENECK

The much-discussed Bottleneck through Colma and the cemeteries has not only been broken, but has been trimmed up, smoothed out and beautified until it not only meets the traffic needs but as recently completely paved by Hanrahan Company it is a pleasure to the driver and is an engineering accomplishment over which any engineer might justly feel proud.

COORDINATING CONSTRUCTION AND TRAFFIC

The construction of the pavement on this contract was an example of coordination of plans for construction and traffic needs. It was constructed in a series of 10-foot strips, placed in pairs where possible and the program so arranged that at all times the old pavement, several short rock detours, and the newly constructed strips were so combined that traffic was inconvenienced so little that it was often remarked that the confusion was even less than that on the old road before the job was started. Consisting of two 30-foot concrete pavements separated by a 28-foot curbed-in strip used by the Market Street Railway it does away with confusion of two-way traffic, safeguards the traffic from street car interference and meets the requirements of the heaviest traffic of any highway in the state, that of approximately 29,000 cars in a 16-hour count.

SKYLINE BOULEVARD

The Skyline boulevard is again on the construction program. Since the bond issue funds were exhausted, little has been done on this highway except to oil and rock it under maintenance crews.

The constructed section extends from San Francisco along the hills adjacent to the ocean to a junction with the La Honda road at the summit between the ocean and Woodside.

This accommodated the daily traffic and week-enders whose destination was the beauties of La Honda or way points.

With the advent of the additional one-cent gas tax, funds are available to continue this road; accordingly it is expected that bids will shortly be invited and if satisfactory a contract let for grading and surfacing this 14-mile stretch which extends from the La Honda road to Saratoga Gap which will afford a new and continuous route from San Francisco to the city of Santa Cruz via the California Redwood Park and the town of Boulder Creek.

VALLEY ROAD CONNECTIONS

The state highway connecting San Francisco and the East Bay cities with the San Joaquin and Sacramento valleys is rapidly approaching a standard that will meet increasing demands of tourist and truck traffic.

Before and After Colma Bottleneck



The installation of rock shoulders from the northerly boundary of Alameda County to Livermore by maintenance forces, and the completion of 9 miles of second-story concrete pavement 20 feet wide, from Livermore to Dublin, by Contractor Ball, have led up to the Dublin to Hayward section, which is now under contract by Ariss-Knapp Company of Oakland. This road is being widened, alignment and grades improved, and rock surface placed, while at the same time three concrete arch bridges are being built at line changes by Contractor E. B. Skells.

CONSTRUCTION "PROGRAMMED"

The system of programming long jobs is well proved on this contract. The contract was let with the stipulation that as the job would last over the winter, certain work was to be done before the winter rains to allow of a systematic control of traffic and the carrying on of that part of the work during the rains that would least interfere with traffic. This has been done. The section from Dublin to three miles westerly toward Hayward has been graded and rocked. Heavy cuts at a point three miles west of Dublin, known as Bulmer

(Continued on page 31.)

A Whole Town in One Institution

Something of the Wide Range of Duties that the Division of Architecture Covers

By C. H. KROMER, Member American Society of Civil Engineers, Structural Engineer, Division of Architecture.

THE TASK of building a whole town in one institution is the job that confronts the Division of Architecture in planning the construction program of the larger institutions of the state.

This is true because these state institutions in large part are in the nature of small municipalities. A few facts will illustrate this.



C. H. KROMER.

The population of state hospitals is approximately 2000 each. San Quentin—the larger of the two state penitentiaries—has a total population of over 4000 people and is gaining an average rate of three prisoners a day. Folsom has a population of approximately 2500 people. Other state institutions have

larger populations than many of the smaller incorporated cities of California. Thus in planning a construction program for one of these institutions the Division of Architecture must meet the engineering requirements demanded of the city engineer, together with the requirements demanded from an architect.

MORE THAN BUILDERS

But this is not all. The Division of Architecture is not concerned alone with building. Consideration must be given to care for the physical well-being of the wards of the state; to providing them with heat, light, hospital facilities, workshops, cooking and dining facilities, places for the care and repair of clothing, and a large number of other activities that in the town are met by specialized service.

The Division of Architecture accordingly must be a specialist in the general practice of the profession. The state architect must know how to build industrial plants of various kinds. Brick-making plants, gas-making

plants, machine shops, laundry, mechanical and electrical plants, as well as a score or more of other industrial establishments, come within the range of his activities.

In addition to being an industrial engineer the state architect must also be a practical farmer with expert information on how hay barns, silos, dairy and other farm buildings should be built.

This is only part of the story. He must be an expert on kitchen construction and refrigeration equipment. And his information on this subject must represent the very latest thought in the architecture and planning of dietary institutions.

Nor does this end the tale. Institutions must be heated. Water must be provided. Sewage systems must be laid out. Irrigation plants must be developed. And in general the Division of Architecture must plan a state institution in all the details needed in the life of a municipality.

HOW THE WORK IS DONE

It is of interest to know how this is done and the care that is taken to guard against mistakes.

At the head of the Division of Architecture, which is an integral part of the Department of Public Works, is the state architect. An assistant chief of the Division is in charge of all designs, and a deputy chief is in direct charge of the administrative and financial work of the Division.

In order that it may more efficiently provide the services demanded of it the Division is divided into Architectural, Clerical, Estimating, Construction and Engineering sections; but in carrying out the various prerogatives of the Division the sections are actually further subdivided into the following units: Architectural Designing and Drafting, Specification Writing, Structural Engineering, Estimating, Engineering (Mechanical, Electrical and Civil), Construction and Clerical. In addition there is an Accounting Department maintained in connection with the Division of Engineering and Irrigation and the Division of Water Rights.

Four designers and two assistant designers,

(Continued on page 23.)

A Super Highway in Europe

By C. L. McKesson, Material and Research Engineer, Division of Highways.*

THIS very unusual highway project 42 miles in length extending from Glasgow to Edinburgh, in Scotland, is of unusual interest in that it is probably one of the most expensive pieces of road construction ever undertaken. It has been carefully designed to meet the designs of modern high-speed interurban traffic. In type of construction it exemplifies the most approved European construction.



C. L. McKesson.

COST OF QUANTITIES

Some idea of the magnitude of the project will be conceived from the following table of costs and quantity: The total estimated cost is \$10,878,262.64 including \$1,776,272.50 for bridges and \$942,962.24 for lands. The average construction cost, exclusive of bridges and right of way is about \$195,000 per mile. Excavation of soft material 2,150,000 cubic yards; excavation rock 67,000 cubic yards; weight of Telford base 300,000 long tons; weight of surfacing 153,000 long tons; length of drains 82½ miles; maximum depth of cut 24 feet; maximum height of embankment 44½ feet.

ADJUSTABLE BRIDGES

The road traverses a rather sparsely populated section and passes through several villages but no large towns or cities. Most of the road is on new location although old routes have been utilized for a portion of the way. Coal mining has been carried on for many years in the region traversed by the road and subsidence of the entire countryside occurs from time to time. This unusual condition has been taken into consideration in the design of bridges which have been made adjustable by keeping the deck separate from the abutments in such places and by providing recesses in which hydraulic jacks can be

placed for the purpose of raising the bridge deck from time to time as this becomes necessary. In one or two places where the coal has not already been mined the highway authorities purchased the coal "in place" from the owners with the understanding that it be allowed to remain and that lowering of the road be thus avoided.

SEPARATE TRAFFIC LANES

In the design of this improvement the engineers took into consideration the prob-



Telford base under construction.

ability of urban development along the new route. They also took into consideration the difficulty which has been encountered in Europe and elsewhere in getting traffic to utilize to the best advantage a roadway con-



Section of finished roadway on the Glasgow end. Sidewalks are of tar macadam. After the Telford base is thoroughly locked and filled, the road is surfaced with three inches of tar and macadam.

*This is the first of a series of articles by C. L. McKesson, Material and Research Engineer, Division of Highways, giving his impression and observations of road practices and some additional engineering features gleaned during a trip through the British Isles and France, with a brief side trip into Germany. This trip in so far as road inspections were concerned covered approximately 2000 miles of automobile travel.

taining a large number of traffic lanes. Experience on some very wide pavements near London had indicated that it is very difficult to secure a distribution of traffic on excessively wide roadways. As a result of their observations the engineers who designed this

work have planned that the entire improvement ultimately have two traffic lanes, each 30 feet in width.

DETAILS OF DESIGN

On approximately four miles adjacent to Glasgow the roadway has been graded to a width of 120 feet between slopes. The typical cross-section shows two 10-foot sidewalks, a 5-foot parking on each side for service pipes, two 30-foot roadways with a strip in the center 30 feet in width which it is expected may be used by an electric railway. On the next 31 miles the road is being graded to a width of 100 feet between slopes and one 30-foot roadway is constructed with one edge adjacent to the center line. The cross-section also shows an 8-foot sidewalk. On this section it is planned that future development, when required, will include the construction of another 30-foot roadway separated from the first by a curb along the center line of the road.

In general, the road is to have a Telford foundation about 12 inches in thickness placed in a cinder subbase.

An accompanying picture shows the Telford base under construction. A very heavy concrete curb has been constructed along each side of the roadway extending to the full depth of the Telford base. This curb serves as a foundation for a 6-inch by 12-inch stone curb which projects above the roadway with a 6-inch curb face.

The other picture shows a section of the finished roadway on the Glasgow end of the project. The sidewalks are of tar macadam. After the Telford base is thoroughly locked and filled the road is surfaced with 3 inches of tar macadam which is to be followed, after traffic has used the road for a time, by a 2-inch covering of asphalt concrete. This type of construction appears massive compared with some of our thin reinforced road slabs but it is, in general, typical of the practice that has prevailed on important roads in France and Germany for many years. It is due to this heavy but more or less flexible base that it has been possible to build up road surfaces which successfully withstand continuous traffic, practically without load limit. It is nothing unusual to see heavy steam-driven trucks with net loads of 30 tons or more traveling at high speed.

In this connection it is interesting to note that while such extremely heavy loads are permitted on the highways that the freight cars on the railroads carry only 8 to 10 tons.

The surfacing on this road, first of tar macadam and then of asphalt concrete, is also more or less typical of English practice.

On some of the new grade reinforced concrete base is being constructed. This base has a cinder and stone subbase and is itself in reality a very substantial pavement. It is laid in 20-foot panels with reinforcement top and bottom. The panels are constructed alternately and a reinforced concrete beam is built under each transverse joint. The concrete is 8 inches in thickness and of 1-2-4 mix. This very rugged concrete pavement is to have a cover consisting of 2 inches of asphalt concrete. It will be noted that the total thickness including subbase reinforced concrete and asphalt wearing surface is 18 inches.

STORM DRAINS

A storm drain system is being installed and catch basins provided throughout the entire route for handling storm water. Considering the great width of the improved roadway and the heavy type of construction it is not at all surprising that the total cost of this road should reach the stupendous average of \$250,000 per mile. On the section adjacent to Edinburgh the total estimated cost is \$369,854 per mile.

INTERSECTIONS

The chief engineer has given much attention to the proper design of intersections and also to the matter of securing proper sight distances on vertical curves. The intersections, where completed, under this plan had a very pleasing appearance and seemed to insure reasonable sight distance.

SIGHT DISTANCE ON VERTICAL CURVES

The following is quoted from the chief engineer's description of the design of the vertical curves:

"Vertical curves at sags are to be parabolic. The length of the curve is to be generally 150 times the algebraic difference of the grades per cent (equivalent to a circular curve of 15,000 feet radius). Vertical curves at summits are to be parabolic. The length of the curve is to be 120 times the algebraic difference of the grades per cent (equivalent to a circular curve of 12,000 feet radius) except at bridge or other crossings where it is necessary or desirable to keep down the amount of banking, where a length of 80 times the algebraic difference of the grades per cent is desirable and a length of 50 times will be the ultimate minimum (equivalent to a circular curve of 8000 feet and 5000 feet radius respectively). With such vertical curves at summits, the minimum lengths of the line of sight to the horizon from a point in a motor car 5 feet above the ground are respectively 346.4 feet, 282.8 feet, and 223.6 feet, and the distances at which two motor cars 5 feet high become mutually visible are 692.8 feet, 565.6 feet, and 447.2 feet."

This important highway project is conducted under the general supervision of Sir Henry Maybury, Chief Engineer of Trans-

(Continued on page 24.)

Economics of Coordinated Water Are Studied by Legislative Committee

HEARINGS upon economic and financial phases of the proposed plan for the coordination of the water resources of California were held by the joint legislative committee in San Francisco on February 20, 21, and 22, and in Sacramento on March 16th.

The large attendance at these meetings and the interest shown in the hearing evidenced the importance that the people of California are attaching to the investigation of the water resources of the state and the effort to solve the problems attached thereto.

The discussion at the San Francisco hearing, lasting over three days, centered about the following subjects:

1. Physical features of the plan and the first unit suitable for development.
2. Suggestions for financing the project.
3. Plans for distributing the power that the various projects would generate.
4. The rapidity with which an attempt should be made to make the plan in part at least effective.

OTHER ISSUES

At the Sacramento hearing the morning session was devoted chiefly to the consideration of the plan as its affected mountain and foothill counties. The questions at issue had particular reference to the reservation of a portion of the water falling upon and originating in these counties for the use of lands located therein.

The afternoon session, which consisted of a conference between the Legislative Committee and the members of the Sacramento-San Joaquin River Problems Conference, developed an entirely new angle in the discussion of the problem. Members of the latter conference committee urged the importance of a program that would afford early relief to the delta lands and thus overcome objection to the diversion of water in the Sacramento and San Joaquin valleys.

PHYSICAL FEATURES OF THE PLAN

This phase of the subject centered chiefly about the relative merit of the Kennett and Iron Canyon projects.

Representatives of the manufacturing interests along Carquinez Straits and Suisun Bay declared that while 3500 second-feet released into the delta of the Sacramento and San Joaquin rivers would solve the salinity problem as far as farm lands in the delta were concerned, it would not give the industries the large supply of cheap water upon which they stated their successful operation depended. Speakers declared that the growth of California up to this time had largely been the result of the development of agriculture through irrigation. Future growth, it was predicted, would depend upon the growth of manufacturing. This in its turn was declared to be dependent upon the presence at manufacturing sites of large supplies of cheap water.

Speaking upon this phase of the matter Mr. Warren McBryde stated that nowhere in the world was there a landlocked harbor with large supplies of fresh water so close at hand as was the case with San Francisco Bay. To make that supply available, he declared, that a barrier must be erected.

Mr. McBryde also urged the importance of developing industry as a market for the power that would be produced under the coordinated plan. He estimated that \$15,000,000 would be available for the construction of a barrier, if the earnings as a highway toll bridge were capitalized; and that another \$15,000,000 would be available from its use as a railroad bridge. The damage to industries to date from the invasion of salt water was placed at over \$25,000,000.

The importance that the industries of the section attach to the barrier was evidenced by the announcement that they had employed Thomas S. Means to make a study of the economic phase of the barrier construction.

SUGGESTIONS FOR FINANCING

There were a number of suggestions for financing, all of which contemplated a substantial income from power sales. Representatives of power companies indicated their willingness to take over the power load if it could be acquired at a cost not greater than they would have to pay for that privately developed. It was also pointed out that the

generation of power by steam is now lower in cost than that developed by water, owing chiefly to the low cost of oil.

The question of whether or not any part of the cost could be levied on agricultural land developed a difference of opinion among representatives of agriculture there. Against the statement of one spokesman that the entire project would have to be financed without charge to farm lands, another spokesman declared that some farmers must prepare to spend more money upon their land than they now are spending or their condition would get worse rather than better. A resident of the lower San Joaquin Valley stated that in that area pumping plants and equipment in that district, represented an investment of \$25,000,000 for which the farmers were paying. He declared that the plan for coordinated use of the water of the state would mean a huge saving in pumping equipment to landowners of the southern San Joaquin Valley.

There were recurrent suggestions of a state bond issue to cover the cost of the initial development. One speaker suggested that the state issue bonds with certain designated and benefited districts and areas upon which the burden of their repayment would fall.

One suggestion was that the state adopt a plan by which water would be sold at cost less the power income. This same speaker declared that there should be an actual reservation of water in any reservoirs that might be built to take care of the future irrigation of lands in the Sacramento Valley and their adjacent foothill areas. He suggested that a very nominal standby charge might be made against these lands for this water reservation.

A plan advanced by another speaker was that the project be divided between the federal and state governments; that the former assume the cost of the Iron Canyon project and the latter the cost of such other units as might be included in the initial development.

Mr. W. H. Holmes, representing the Modesto Irrigation District, declared that the dams constructed by irrigation districts along the east side of the San Joaquin Valley had helped fresh water conditions in the delta by equating the flow of the river. It was his opinion that these districts should be given credit for this in any plan for financing a state-wide plan that might be adopted.

DISTRIBUTION OF POWER

Power loomed up large in all discussions as to financing. The method of distributing power was the occasion of the chief debate of the entire proceedings. Franklin E. Hichborn urged that the committee study the Ontario plan, and advocated state distribution of power in the manner advocated in the Water and Power Act. He urged that distribution of the power by the state should be included as an essential part of any plan, and that no attempt should be made to do anything with the plan unless means and methods had been perfected for the immediate distribution of power by the state.

L. A. Bartlett of Berkeley followed Mr. Hichborn. His plea was that cities be allowed to buy state-generated power. He suggested that high-duty power lines be made public carriers, thus assuring competitive rights to power users. Mr. Bartlett stated that he was unwilling to go as far as Mr. Hichborn in asking that nothing be done until state distribution of power was assured. He urged, however, what he

termed the essential importance of the sale by the state of actual kilowatts as against a sale to private power companies of the privilege of generating power. In this matter Mr. Bartlett also urged a sale of power, if made to private companies, on a year-to-year basis.

THE TIME ELEMENT

Many speakers urged that the time element was a controlling factor in the whole plan. John S. Drum declared that the state was now acting 10 years after the time that this plan should have been made effective. Speakers from the lower San Joaquin also urged the importance of having a report with a recommended plan ready for submission at the next meeting of the legislature.

Against this, other speakers declared that the legal phases of the plan had not been considered, and that sufficient time must be taken for a thorough study of its every phase.

A number of speakers voiced the thought that the important thing to do was to develop a complete plan which could be carried out on a unit basis, and into which each development would have its proper place.

Fred H. Tibbetts voiced an objection to "proceeding too fast," declaring that the plan might be used, but only if this danger of overhaste was avoided. The salinity problem, he stated, was not getting worse but would get better. He also stated that there was sufficient water in the streams for present irrigationists in the Sacramento Valley. The industrial problem, he predicted could be solved by the construction of a dam at Fall River on the Trinity River at a quarter the cost of a salt water barrier.

ASK LOW HEAD DEVELOPMENTS

At the Sacramento hearing the method suggested to secure the early relief required was that low head developments for the storage of water should be given precedence over high head projects. The lower cost of such low head developments, their greater accessibility, and the less time that would be required for their construction were cited as evidence of the fact that they would give the relief desired before such relief could be secured from more extensive projects such as the Kennett Dam.

To assure the priority of such lower and cheaper development in the construction program of public utility companies, members of the conference urged that the law be amended to empower the Railroad Commission to select the sites and locations for dams and decide project priorities in the construction program of public utility corporations. The exercise of such power is justifiable, so its proponents urged, on the ground that the State Railroad Commission should take all uses of water into consideration, and that the use of water for the generation of power should not outweigh all other uses.

Specifically the conference committee named the Folsom Dam as one that could be built immediately. The Iron Canyon and Trinity River dams were also suggested as structures that would fit into such a plan.

Objections to the proposed low head development were urged as follows:

First, high head dams develop cheaper power than low head projects:

Second, if the cost of the hydro power is materially increased, the companies will be forced to the use of steam power, and water storage by public utilities will largely cease.

The statement was made that the cost of generating power as between hydro and steam plant is so close now, that while hydro power is cheaper in Oakland than steam power, the reverse is true in San Fran-



 INYO SCENES

The Old
Order
Changeth
Giving
Way
To The
New

Unique Sierran Contrasts Are Offered by California State Highways

By W. A. CHALFANT, author of "The History of Inyo County," and "The Outposts of Civilization," and editor of the *Inyo Register*.

TO RIDE in comfort along the base of a two-mile-high snow-capped range, "the crown of California," as one visitor termed it; to have a try at skiing, snowballing and winter sports; to view some of America's noblest scenery mantled in its winter whiteness, while the beholder basked in balmy sunshine; to dip into a warm and delightful plunge under a midwinter sky; to enjoy high-class accommodations and a never-lagging hospitality and welcome—such were some of the details noted by something over a score of guests of the Bishop Chamber of Commerce, during a winter sight-seeing tour to Owens Valley and the high Sierras February 11, 12 and 13.

Tens of thousands of people know the Sierras in their summer aspect: comparatively few know of their winter sublimity or the comfortable enjoyment of that spectacle. The tour was planned on nonprofit lines, to introduce those charms to a new public. Every Los Angeles newspaper, its chamber of commerce, tourist bureau and motor transit companies were represented in the company of travelers. A comfortable big motor bus was the means of travel.

Leaving Los Angeles on the morning of the 11th, the party reached Little Lake for lunch. The day's journey, past the chemical plants on the shore of Owens Lake, through Lone Pine, and past the bases of Mount Whitney, Mount Williamson and other towering peaks, ended at Independence, where a dance in honor of the visitors preceded their repose at the modern Winnedumah Hotel.

Bishop was reached early the next day, and the noted Kittie Lee Inn became the base of operations. Citizens had private cars ready to convey every one to Mammoth, center of scenic interest. There lunch, provided by the chamber of commerce, was ready, and afterward cars took passengers on another mile or so to where snow unbrokenly covered the ground.

Return was made for the night. An item of the entertainment available was a display of films of the beautiful series of mountain pictures, motion and stills, to which J. W. Bledsoe, veteran photographer, has devoted some years of labor. As it happened, the theater's regular program at the time included one of the many movies "westerns"

filmed (wherever the scene is supposed to be laid) in Owens Valley and vicinity.

While in Bishop, some of the visitors hunted up some of the local novelties. One of these is a bar said to have cost \$8,000, which originally decorated Tex Rickard's noted Goldfield "Northern" saloon. Another novel industry of which they learned is a "fish-worm" farm—an enterprise not so fishy as it sounds, for the small boys of the vicinity collect an aggregate running into hundreds of dollars yearly by the sale of "garden hackle" to tourists who rely on that time-tried bait rather than on the fancy flies affected by the aristocracy of anglers.

On Monday, February 13th, the more than delighted sightseers left for their fields of labor, stopping on the way for the enjoyment of a plunge at Keough Hot Springs, and a complimentary lunch at Lone Pine.

Every visitor was enthusiastic over his or her experience on the brief outing, and a dozen or so of them committed their opinions to writing. Such phrases as "wonderful hospitality, most gorgeous country, marvelous time, marvelous people, wonderful trip and climate, majestic splendor of the high Sierras," are samples from that symposium.

Among the items praised was the wonderful roads leading to the high Sierras scenic region. In that he points out a factor of prime importance in making the country better known, in the vast improvement of its southern approach. Time was when an auto trip from Los Angeles lacked much of being enjoyable. One by one the drawbacks have been overcome. Corkscrew roads have been straightened, and courses changed to eliminate needless distance. Surfacing and oil have supplanted loose gravel and sand. What has been already done has practically cut traveling time between Los Angeles and Owens Valley in two, while the discomforts have been reduced in more than equal proportion. Other sections of California have road improvement also, but probably there is no other equally long drive in which the contrast between the past and the present is more marked. Improvements still go on, under the able direction of Division Engineer Sommer, for whom his district has only the highest commendation.

It was dusk as she stopped at the roadside filling station.

"I want a quart of red oil," she said to the service man.

The man gasped and hesitated.

"Give me a quart of red oil," she repeated.

"A quart of r-r-red oil?" he stuttered.

"Certainly," she said. "My tail-light has gone out."

Chief Solano Will Sleep Undisturbed By Modern Traffic

Progress executed a right flank movement in deference to sentiment, in order that the bones of an aboriginal American hero may lie undisturbed.

Square in the middle of the right of way of line changes just ordered by the California Highway Commission between Rockville and Cordelia, Solano County, stands a lone buckeye tree, a living monument to the mouldering remains of Chief Solano of the Suisun tribe.

Solano County was named for the old chief, who rates as one of the most heroic and best regarded Indians of pioneer days in California. Few of his tribesmen remain, but a number of years ago, the buckeye tree, one of the first brought to California, was planted on his grave by Solano citizens as a testimonial to Solano's friendliness to men and women of the Caucasian race.

Completion of state highway changes between Rockville and Cordelia will soon result in thousands of cars thundering by the lone buckeye, but Solano will sleep undisturbed.

Highway Officials Adopt Resolutions of Respect

The following resolution was adopted by the Western Association of State Highway Officials, which was in session in Los Angeles at the time of Mr. Fletcher's death:

WHEREAS, Austin B. Fletcher, one of the founders of the Western Association of State Highway Officials, passed away at Washington, D. C., on March 9, 1928; and

WHEREAS, Mr. Fletcher was one of the notable highway engineers of the United States, embodying in his life both the high ideals of his profession and its outstanding service to state and nation; therefore be it

Resolved, That the Western Association of State Highway Officials extend to the relatives of Mr. Fletcher in their great sorrow, the heartfelt sympathy of its members; and expression be given to the sorrow that the members of this association feel in the loss of a personal friend and a most honored and able member of their profession; be it further

Resolved, That a copy of this resolution be spread upon the minutes of the Western Association of State Highway Officials as a lasting tribute both to a life well lived and to a career, a monument to which are better highways the nation over.

"Listen," remarked the exasperated driver over his shoulder, "Lindbergh got to Paris without any advice from the back seat."

CALIFORNIA HIGHWAYS AND PUBLIC WORKS.

Official journal of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

BERT B. MEEK.....Director
GEORGE C. MANSFIELD.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 5 APRIL, 1928 No. 4

THEORIES OF STATE HIGHWAY FINANCING THE QUESTION

1508 Chestnut St.,
Philadelphia, Penn.

Department of Highways,
Sacramento, California.

Dear Sirs: I am preparing data on the subject of the maintenance of principal or state highways through the medium of gasoline and motor vehicle taxes solely.

Kindly advise me what policy your state pursues in this connection and what your general opinion is regarding the matter. If you have issued any publication dealing with the subject I will appreciate your sending me several copies thereof.

Awaiting your convenience, I remain

Very truly,

ROBERT MAYER.

THE ANSWER

To which the following reply was made:

The present policy of California is that state highways are financed solely through the imposition of taxes on gasoline and fees upon motor vehicles. In the early days of our state highway history, roads were built through funds derived from bond issues.

In our opinion the method of financing highway construction depends largely upon the era of highway building in which a given state finds itself and the attitude of the public of that state toward good roads.

Thus the bond issue method in the early period of California's good road development was undoubtedly the best plan to finance the construction of improved roads, running into what was then considered a very large cost per mile. In fact it was probably the only method that could be used, as the number of registered motor vehicles and the consumption of gasoline in highway transportation was then so small that it would not have yielded sufficient income even to have made a start upon any program that would promise

an adequate state highway system. Bond issues made a large sum of money immediately available, enabled a state road system to be under way in a comparatively short time and by actual demonstration educated the people in the knowledge that good roads pay for themselves with big dividends added. The bond plan also enabled the cost of these early roads to be spread over the generations that will enjoy them and profit by them. Nor will these later paying generations be injured, as the roads that are being and will be turned over to them are an asset far greater in value than the debt that they will be called upon to pay.

This early period, however, in California's road history is past. In public affairs as in private business, it is foolish to borrow money when payment can be made from cash in hand. The number of motor vehicles has increased from 28,600 in 1909, the year that California voted its first bond issue, to 1,736,765 in 1927. The gasoline used in motor vehicles in California totaled 1,071,680,000 gallons in 1927. It will thus be seen that the uniform charge of \$3 levied upon passenger cars, in California, with a graduated fee upon trucks, together with a tax upon gasoline, yield a sum that enables California to build and care for its roads on a pay-as-you-go plan.

While it is true that interest on bonds should be considered as part of the operating costs of highways and not as a capital investment, and that the book cost of roads is the same whether built with borrowed money or paid from existing reserves or income, yet this is largely a matter of bookkeeping technique. The fact remains that the taxpayers are little concerned as to whether the saving made by the pay-as-you-go plan is credited to construction or operation as long as the money remains in their pockets. The saving in interest charges to California taxpayers by the cash payment plan as compared with the issuance of bonds amounts to many millions of dollars annually, and constitutes a very real reduction in the cost of state government.

To put the matter briefly: California's experience is that good roads, properly located and well constructed, pay whether built with borrowed money or paid for with cash. It is good business to pay cash if you can. It is poor business to go without the roads, if a bond issue will make them available.

There are only two really important questions before the American people today—how to pay and where to park.—*Exchange*.

Highway Policies in California

Director of Public Works Tells Outstanding Features of State Road Administration

By E. B. MEEK, Director of the Department of Public Works, State of California.

THE highway history of California may be divided into three periods. The first period dealt chiefly with construction activities. The second was characterized by the development of better and more adequate maintenance methods. The third period, upon which we have now entered, should be marked by both activity in construction and adequacy in maintenance.

California pioneered the way among the states of the nation in the construction of improved highways. Unfortunately the word "permanent" instead of the word "improved" was used in popularizing these early roads. The impression created was that improved roads, even without proper maintenance, would prove permanent in fact as well as in name.

The result of this false impression as to the permanency of surfaced roads was that maintenance allotments as compared with the mileage of improved highways became increasingly inadequate. When the roads gave evidence of impairment under the traffic that they themselves had created, the people awoke suddenly to the fact that highways that they had considered as indestructible were breaking down. The public was startled and confused. And yet looking back over that period and with the knowledge that we now have, the wonder is that the narrow and thin pavements stood up as well and as long as they did under the unexpected traffic. In fact many miles of these early pavements are still in service.

CONTRIBUTION OF EARLY BUILDERS

The contribution of these early builders of California's highways was a threefold one:

First, without precedent to guide them or experience to teach them, a pavement was designed that for years carried a traffic far greater than the most enthusiastic of early day good roads promoters predicted.

Second, this pavement was generally so designed that it could be widened and thickened without the loss of the original investment, when the surface began to break under the stress of traffic.

Third, the narrow and thin pavements then built made possible a highway mileage that

in its turn accustomed and converted the people to the gospel of good roads.

SECOND PERIOD

The second period of our highway history, from which we are just now emerging, was characterized rather by the development of adequate maintenance methods than by the extension of improved highways.

Brought to a realization of the fact that improved highways were not of necessity "permanent" roads, the public also realized that these roads were worth to the state many times the combined total of their construction and maintenance cost. Money for adequate maintenance, including widening and thickening operations, was voted by a law levying a two-cent tax on gasoline. Increased traffic also made necessary a better alignment of highways than was required during the earlier period when the traffic volume was less. The work both of maintenance and realignment was ably performed.

A further notable improvement of this second period was the separation of many highway and railroad grade crossings by the construction of overpass and underpass structures. In other instances grade crossings were eliminated by relocating highways on an alignment that avoided track crossings. There is still much of this work to be done, but an excellent beginning has been made.

NOW ENTERING THIRD ERA

With revenues for new construction again made available through the one-cent gasoline tax enacted by the last legislature and approved by Governor Young, we are now very definitely entering upon the third period of our highway history. This period should include the outstanding features of the two earlier periods. It should be one of construction activity coupled with adequate maintenance.

Those of us in whom responsibility for the administration of our state highway system is now vested, should profit by the experience of the early road builders. We must prepare for a traffic far greater than that which now exists. In building methods and highway

policies, we must look both backward and forward.

In building for the future, however, we must not forget that we also owe a duty to the present. Mr. Fred S. Moody, member of the California Highway Commission, put this matter very succinctly in an article dealing with California's mountain highways. Referring to the change from bond issues to gasoline taxes in financing road construction, Mr. Moody well said: "We are building our roads on a pay-as-you-go plan, and the people who are footing the bills should be entitled to road service within their life time." I heartily concur in this statement.

TEN COMMANDMENTS

I might summarize outstanding phases of present highway policies in the following Ten Commandments of California road building:

1. The present highway system must be completed within as short a time as is compatible with sound engineering and economical construction. We want haste, but not the kind of haste that makes waste.

2. The inclusion of new roads into the state system should be postponed until such time as the present system nears completion.

3. Adequate provision for future development should be assured both through providing wider rights of way NOW, and through reserving for public use areas adjacent to the highways of particular scenic charm or recreational value.

4. On roads where present traffic is not heavy, a low cost surface should be provided that will adequately care for the existing travel, and which will become a part of a well-packed base, when future traffic demands a larger pavement investment. Our recommendation for this class of highway is the oil and rock surface, known as the California type pavement.

5. Relocation of roads should be made where it is possible to eliminate grade crossings by such realignment. An agreement should be reached between state highway and railroad officials for a definite cost-sharing policy in the construction of grade eliminations and grade separations.

6. Repair on our highways must be immediate and continuous. Every maintenance man in our work must also be a minute man. Regular traffic counts and studies must be made to determine traffic trends and to enable present roads to be widened and thickened in advance of deterioration or destruction.

7. The routing of present unlocated roads by "the most direct practical route" as prescribed by law and as determined by experts, trained and skilled in this work, must govern in all location matters. In the words of Governor Young, location of our highways must be determined "by traffic pressure rather than by political pressure."

8. Highway funds are to be budgeted for each biennium in advance of their expenditure. Suggestions and proposals for highway financing outside of and in addition to present revenues should be discouraged. Our present income we hope will be adequate and if we spend it wisely we believe will be continuous.

9. Construction of toll roads for through traffic should be discouraged. This is the business of the state and counties.

Illuminated Railroad

Grade Crossing Signs

Realizing that the hazard at railroad grade crossings is much greater at night than during the day, R. E. Pierce, Acting District Engineer of District Ten, with headquarters at Sacramento, has installed a number of



illuminated signs at various main line grade crossings in this district.

Two crossings have been so protected at Tracy for some time, and the comments from people who travel this stretch of highway have been so favorable that we have just completed the installation of signs at two more grade crossings, namely, Hatch crossing south of Modesto and McConnell crossing south of Sacramento.

10. Construction should be by contract rather than by day labor, unless the bids of contractors are unreasonable.

In conclusion: The State Department of Public Works will spend over \$50,000,000 during the present biennium.

We intend to see that these millions are spent legally and prudently and in a manner consistent with good public policy.

Further we intend that the people shall know *in advance* just where we are spending this money, just how we are spending it, and why we are spending it as we are. It is their money. As stockholders of the State of California, they are entitled to authoritative information as to where, how and why their money is spent. CALIFORNIA HIGHWAYS AND PUBLIC WORKS, the official journal of the Department of Public Works, is issued to give this information to the people.

If I might characterize in one phrase the policy outlined above, I would say that it is one of partnership between the people of California and the authorities charged with responsibility for the construction and maintenance of the state highway system; a partnership that has for its object the building and betterment of the state that it is the great privilege of all of us to serve.

CALIFORNIA HIGHWAYS

The highways are an endless chain
That lead from here to there,
With no beginning and no end
But reaching everywhere.

On concrete ribbons smoothly laid
A million motors glide,
The work of engineering skill
And California's pride.

Throughout this realm of scenic charm
On every hand they go,
From Shasta's view in Siskiyou,
To mystic Mexico.

Here orange groves with vineyards vie
And fruitful orchards bloom,
While towering to the vaulted sky
Great snow-capped mountains loom.

Where can be found such wondrous scenes
Amid a clime supreme?
A paradise for motorists
Beyond their fondest dream.

The tourist from the icebound East
Finds here relief and rest,
With welcome to a sun-kissed land
And highways of the best.

—Charles L. Tompkins.

A "Model" Application

Below is an exact copy of a letter received in one of the districts of the Division of Highways from an applicant for an engineering position.

"This morning I left my formal application in your office. Look it over. There is some good experience represented thereon—experience which I have profited by. While on the U. S. Geol. Sur. I was considered "plenty good"—one of the best recorders and rodmen of my time. I was accurate, speedy, and neat. Not long ago I applied for a certain engineering position but was sensible enough to turn it down as I did not know some necessary methods for the efficient discharge of my duties. It hurt like hell to have to give up—but it did not daunt me! I went home and learned the method; and this has a direct bearing upon my applying to you. What I do not know, I'll soon learn. You will never regret employing me. Remember that when you need your next man.

"While I prefer to remain in the office on account of being married and having a small family, I will readily go into the field whenever you deem it necessary. I know the adjustments and uses of the transit, level, plane table and theodolite; being most skillful with the level. When you need your next subordinate, notify

Yours truly,

"You want a man—
I want a job—
You have the job—
And I am the man!"

SOME DEFINITIONS OF ENGINEERING TERMS

This list of definitions was compiled by R. W. Emery of Cleveland, Ohio.

DRAFTSMAN—A man who puts his ideas on paper for the boss to change.

CHECKER—A man with a blue pencil but without a conscience.

TRACER—A slave who, knowing nothing himself, never understands what the draftsman thinks he knows.

BLUE PRINT BOY—A skunk with a dirty neck, who smokes cigarettes and occasionally makes a blue print.

TOOL DESIGNER—A collection of erroneous ideas surrounded by a boss.

DRAFTING ROOM—A place where time between arguments is spent making drawings to be changed.

DATA BOOK—A collection of information that no one needs.

TRACING—A piece of linen used to take the high spots off of erasers.

ENGINEER—A mechanical genius who spends his time thinking up ideas which he refuses to recognize when he meets them on a drawing.

"LIZZIE LIZ"

(With apologies to Kipling's "Gunga Din")

By JOHN HOWE ENCELL, fifteen-year-old son of Harry A. Encell, attorney for the Division of Highways.

You can talk of all your cars,
And say that mine is full of scars;
But I'd like to see you beat mine on the hills.
My heap is funny lookin',
And she stands a lotta jokin',
And when it's cold the driver always gets the chills.
Although the brakes are almost gone,
And there's not a shop where she would pawn
She is mine, and I will keep her, Lizzie Liz.
Oh, it's Liz, Liz, Liz,
You chuggin' lump of scrap tin Lizzie Liz.
You are makin' such a racket
You just rattled off a bracket;
For Gawd's sake get a goin', Lizzie Liz!
You guys may think it's funny
When I call my Lizzie "Honey,"
But it's just a little coaxin'
That she needs.
You can swear and you can cuss,
Or even kick my little bus,
But a few kind words is all she ever heeds.
You can talk of Chevs and Stars,
And all those kind of cars,
But I'll keep my little Lizzie Liz.
Oh, it's Liz, Liz, Liz,
Friend Henry's gift to Scotland, Lizzie Liz;
I tell the boys I drive you slow
When it's really all you'll go;
I wouldn't hurt your feelin's, Lizzie Liz.

"Are you fond of autos?"

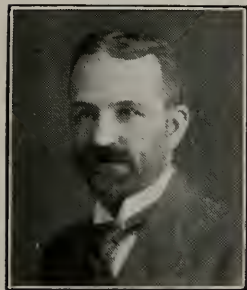
"Am I? Say, you should see the truck I ate for lunch."—*Business Builder*.

Santa Barbara to Plant Trees

Along 20 Miles of State Highway

PLANS for the immediate planting of shade trees on twenty miles of the Coast highway, from Elwood to the county line at Rincon in Santa Barbara County, have been outlined by a committee of Santa Barbara citizens headed by George A. Black.

The committee recommends that the first planting should be done between a point two miles east of the residential portion of Carpinteria and to the Elwood road near the railroad station known as Elwood, 12 miles west of the city of Santa Barbara. The evergreen trees recommended comprise six varieties of blooming evergreens and three varieties of evergreens without blooming qualities.



GEORGE A. BLACK.

There will be thirteen sections along the line of highway to be planted.

The *Cupressus montezuma*, a fernlike evergreen, has been selected to be used between old town, Carpinteria, and the concrete bridge west of Carpinteria, while the beautiful jacaranda, with its slightly leafy foliage and blue trumpet flowers, will start where the *Cupressus* stops and will continue through the residential section of Carpinteria to the east bridge, and from that point easterly the pink-blooming eucalyptus will be used to the fork of the roads north of the Sattler tract of land.

Later, the planting will be continued with a species of tree to be selected, over the remaining one-half mile to the west line of Ventura County but not until the new highway between the two points is graded. From old town to Toro Canyon road, through Serena Park section, where excellent soil conditions prevail, the scarlet-blooming eucalyptus, the handsomest of the eucalypti will be planted.

From Toro Canyon road to the approach to Summerland the silvery blue eucalyptus will be used; through Summerland *Acacia melanoxylon* has been selected; over the new road at Ortega Hill the fantastic, wide-spreading *Cupressus macrocarpa* will be used to the lower lands. At the approach to Montecito to the east city limits of Santa Barbara, the

same tree as used at Serena Park, the scarlet-blooming eucalyptus, will be used.

From San Roque road, along the south side of San Roque Park to La Cumbre avenue the orange, large-bloom acacia will be used. From San Antonio road to the east end of the Lombardy poplars, planted years ago by George S. Edwards, the cream-colored acacia is designated. From the west end of the Lombardy poplars and through Goleta to the concrete bridge the golden-orange acacia is recommended. From the bridge, through West Goleta to Fairview avenue the magnolia is chosen and from this avenue to the east line of Corona del Mar the *Casuarina stricta* is named, and from that point to Elwood station the pink-blooming eucalyptus is to hold sway.

All of the trees in the list are hardy, and many varieties are quick growers.

The entire planting of the evergreens will be done and supervised by the state, as well as the care, irrigation, staking, preparation of soil and fertilization. Leveling of roadways when essential will be undertaken by the men of the Maintenance Department of the Highway Commission, and replacements, if required at any time after the first year, will be paid for and the work done by that Commission.

The Highway Commission will require that a fund representing \$2.25 per tree shall be in the hands of the County National Bank and Trust Company, and that either the trees or sufficient money to buy them also be provided. When this is done, work can be started.

It is the plan of the committee to plant 70 trees per mile in alternating formation on the two sides of the highway, with 150-foot intervals. The cost per mile is \$200. The initial cost is all the communities will be called upon to pay. After the first year, the Highway Commission takes over the planted trees and guarantees to maintain and replace trees that may not survive, or may be destroyed through roadway accidents.

A committee composed of Ralph T. Stevens, E. O. Orpet, Lockwood de Forest, Jr., and George A. Black, chairman, has completed a survey of the district to determine soil and wind conditions preparatory to selecting the best trees. H. T. Campbell, a nurseryman, and Otto Niedermuller, a landscape gardener, assisted in the survey.

HOW STATE HIGHWAY FORCES MET EMERGENCY FOLLOWING DAM DISASTER

(Continued from page 4.)

a subway under the Southern Pacific Railroad in place of the existing grade crossing, it was decided that the proper step to take would be to build a temporary pile trestle across the Santa Clara River on the same alignment as the old bridge. This would make possible utilization of the heavy piers of the old bridge and the south girder which was intact. Mr. Andrew and his assistants immediately ordered material for this work.

Arrangements were made with the representative of the Los Angeles County Road Department to open a temporary road over the Santa Clara River on the old county road alignment to handle traffic for a few days until the trestle bridge could be constructed.

SAN FRANCISQUITO BRIDGE

The river was so high on Tuesday morning that no definite information could be obtained regarding the San Francisquito bridge. The following morning it was learned that the three 60-foot steel girder spans had been washed down stream; that the abutments were intact except that the concrete was broken on the top; that the flow in the San Francisquito River had dropped to a point where the quickest way of taking care of traffic was to put a temporary road through the stream channel far enough up stream so that it would not interfere with the reconstruction operations at the bridge site.

Upon hearing of the disaster, M. L. Sullivan, superintendent of shovel operations on the Ridge road immediately worked his way south to the flooded area. He reported to District Engineer Cortelyou Tuesday morning and was instructed to get his crew, as well as that of Foreman McCullough's crew, immediately at work clearing the roadway north of the Santa Clara River bridge. Later these crews built a detour around the San Francisquito bridge.

ROAD GAP IS BRIDGED

Maintenance Foreman Harbey and his crew worked valiantly in rescue work and in temporarily bridging a washout. A small shovel was sent up to the work on Wednesday to start refilling the washout and the shoulders between Saugus and the Santa Clara River crossing. This washout was 45 feet wide and 20 feet deep and was caused by backwash from the flood. It was of first importance to bridge this gap so that the various utility reconstruction crews and the relief forces could more readily reach points further down the stream. It was also necessary to close this gap to enable a pile driver and lumber to be delivered at the Santa Clara River bridge site.

Fortunately the Maintenance Department had on hand at the Saugus yard practically enough old bridge timber to throw in a temporary structure about 12 feet wide. The crews worked until about 9 o'clock in the evening, completing the bridge in one day. Light traffic crossed it that same evening. The following morning the bridge was further strengthened so that heavy loads of lumber crossed it the second day.

HOURS OF LABOR NOT CONSIDERED

The state maintenance and construction forces responded nobly to the duties that they were called upon to perform. H. H. Brown, employed with Foreman Harbey worked twenty-four hours on March 13th, sixteen hours on March 14th, and twelve hours on March 15th. The balance of the crew worked thirteen

hours on March 13th and eleven hours on March 14th. Mr. Harbey, himself, worked twenty hours on March 13th, eighteen hours on March 14th and twelve hours on the 15th.

In addition to efforts of state crews in the district, two caterpillar tractors with operators and one heavy dump truck were detached from work and sent across the river from Fillmore to Bardsdale there to engage in the relief work at that point. This was at the request of Mr. A. R. Heron, Director of Finance, who was on the ground representing the State Administration in rescue work. Although the working day was completed when word reached the men operating the tractors and truck they immediately started for Bardsdale with their outfits and reported for immediate work there between 9 and 10 p.m. The location and surveying crews in this vicinity also cooperated to the utmost.

MAJOR DAMAGE ITEMS

The major items of damage are the loss of the Santa Clara River steel span bridge, 200 feet long, and the loss of the three through-girder type spans totaling approximately 180 feet at the San Francisquito channel. Evidently the flood with its load of drift swept down on the Santa Clara River bridge, probably topping it. High water marks are observable to a height of at least 15 feet above the roadway at this point. This bridge was swept from its piers. The piers, however, were all left intact. The secondary short span on the southerly end was also left in place. Later the steel truss was found cast up on the west bank about a half mile down stream in a compact-twisted manner.

The north and south abutments of the San Francisquito bridge were left in place, also practically undamaged. The four intermediate cylinder piers were destroyed, and the three spans were deposited at various angles anywhere from 200 to 500 feet down stream. A superficial examination indicated that these spans are not badly twisted out of shape and possibly they may be salvaged for future use.

At this latter bridge approximately 110 feet of pavement was lost at the southerly end and some 80 feet of pavement at the northerly end. The embankment in each place was washed out to a depth of 89 feet.

Serious loss of embankment were suffered at several other places. The total replacement of embankment is estimated at approximately 12,000 yards. In addition to this the pavement was covered near the southerly end of the Santa Clara River bridge with a deposit of sand totaling approximately 450 yards. North of the San Francisquito bridge in the vicinity of Castaic Junction there were two other stretches of pavement covered with sand and necessitating the removal of approximately 4600 yards.

EMERGENCY WORK ORDER SIGNED

Immediately upon receipt of information as to disaster and its consequent damage to highways Director B. B. Meek of the Department of Public Works made a \$30,000 emergency work order available for reconstruction activities. Additional allotments will be made as estimates of the damage become available.

WORK OF TETRAHEDRONS

The part that the tetrahedrons played in averting greater damage than was suffered has attracted wide attention.

Standing directly in the path of the torrent, the bank protection, consisting of a row of thirty reinforced concrete skeleton tetrahedrons, extending out from the river bank to deflect flood water under the main bridge and protect the west approach, was struck by a torrent fifteen feet high.

(Continued on page 25.)

A WHOLE TOWN IN ONE INSTITUTION

(Continued from page 10.)

all under the direct supervision of the assistant architect, care for the architectural design for, and planning of, all building structures, as well as for the landscape architecture required in connection therewith. A complete understanding of the project in hand is obtained by visits to the site and full discussions had with the head of the institution, his assistants and any others who may be directly concerned. Architectural studies and complete preliminary sketches and estimates are then made and conferences continued until the plans are satisfactory and within the money available. A corps of architectural draftsmen working under the direction of a chief draftsman then prepare the working architectural plans and details, make full size drawings in connection therewith and prepare miscellaneous requisition drawings. The Division so functions that whenever one section is unduly busy, drafting assistance is rendered by members of other sections.

The specification writer, with the aid of two assistants, prepares all specifications with the exception of those relating to the engineering portions of the work, and in connection therewith passes upon the acceptance of materials. He also prepares and handles all contracts in connection with the work of the Division.

The structural engineer, with the assistance of a corps of assistant structural engineers and draftsmen, prepares designs, makes working and requisition drawings, checks shop details for all of the structural work of the Division. Examinations are made in order to determine the stability of existing structures and recommendations as to the necessity for alteration, repair, or condemnation. Actual tests of strength of construction, bearing value of soils by means of excavations, loading and pile tests to determine the proper method of supporting the structures are made. These structures are many and varied, such as buildings, underpasses, culverts, towers, tanks, sewage treatment and disposal plants, retaining walls, reservoirs, dams and other water works structures (until the time of the formation of the Department of Public Works, utility, flood control, and similar public dams and reservoirs were checked for the State Engineer), the acceptance or rejection is recommended for all structural materials furnished in connection with the work, shop fabrication and tests of structural materials supervised, proportions

for concrete mixes determined and other related work performed. These problems necessarily involve a familiar knowledge of all materials and their properties used in structural-construction work, whether in wood, steel, masonry or reinforced concrete.

The Estimating Section, in charge of the Engineer of Estimates and Cost, makes complete preliminary as well as final estimates of cost for all projects proposed or undertaken by the Division, and lists and purchases all material for force account work (the final estimates are used as a check on the contractor's bid). If it is found advisable to undertake any work on a force account basis this section also lists and requisitions all materials required and is responsible for deliveries of the material to the job at the right time.

The mechanical, electrical and civil engineering work of the Division is carried on by a corps of mechanical, electrical and civil engineers and draftsmen, under the direct supervision of an engineer with the title of "Engineer," assisted by a mechanical and an electrical engineer. This section prepares all drawings and specifications in connection with mechanical engineering for buildings such as plumbing, heating, ventilating and lighting, for all electrical installations, for power and water supply works, for sewage disposal. It prepares requisitions for force account work, makes surveys, and maintains a general supervision over mechanical installations of all kinds.

The Construction Section is directly responsible for the inspection of field work for contract as well as for day labor work. This work is in direct charge of the "General Superintendent," who is assisted by superintendents of construction and foremen. These assistants act as inspectors for the various contract jobs where construction is going on and as directors of construction for force account work. Where a job is handled by day labor, certain portions of the work are frequently let to subcontractors, and in these cases our representatives act both as inspectors and as superintendents of construction. All mechanics and laborers for the force account work are appointed direct through the medium of the Civil Service Commission.

The Clerical Section consists of stenographers, clerks and assistants.

INSTITUTIONS OF STATE

The Division of Architecture is responsible and active in the preparation of all plans and specifications and the supervision of all state building, as well as other public works

at the various state institutions throughout the state. These institutions include all of the state schools, with the exception of the University of California; such as the State Teachers Colleges, Polytechnic Schools, Schools for the Deaf and for the Blind, Corrective Schools for Boys and for Girls, the State Prisons, and State Armories, Veterans' Homes, Homes for the Feeble Minded, and the State Hospitals for the Insane. The Division is also active in the construction and engineering development of the various hatcheries throughout the state of the Fish and Game Commission, and other state enterprises, such as the State Buildings at Sacramento, San Francisco and Los Angeles; the State Printing Office at Sacramento, the Exposition Building and the Air Port at Los Angeles; the State Fair at Sacramento and other miscellaneous projects throughout the state. At the present time, the Division functions at thirty-three major state institutions, and, in addition, engages in some construction activity at approximately twenty-seven other places.

A SUPER HIGHWAY IN EUROPE

(Continued from page 12.)

port. The proposal of plans, details, and the construction of the work is carried on under the personal direction of Mr. D. A. Donald as chief engineer. It is to these gentlemen and to Mr. Wright, assistant engineer, that the writer is indebted for the information which he obtained regarding the project and for the opportunity to make this inspection.

Maintenance Foreman

Is Killed at Delano

On Wednesday, February 15th, Jesse Pettus, maintenance foreman at Delano, was killed by the explosion of an oil fuel tank on an asphalt kettle, while patching roads in his section.

Mr. Pettus had been with the state for seven years and was one of the most valued and trusted employees in District VI. The entire district mourns his passing and extends heartfelt sympathy to his wife and the five small children whom he leaves.

Card of Thanks

Delano, California, March 3, 1928.

Mr. E. E. Wallace, Division Engineer,
Highway Commission,
Fresno, California.

DEAR MR. WALLACE: I wish to express my most sincere thanks and appreciation for the kindness shown me by you and the employees of Division 6 during my recent bereavement.

Sincerely yours,

MRS. JESSE PETTUS.

ECONOMICS OF COORDINATED WATER STUDIED BY LEGISLATIVE COMMITTEE

(Continued from page 14.)

cisco. In the Los Angeles region, he stated, steam power is cheaper than that produced by hydro plants.

While this condition was attributed to the low cost of oil, it was stated that coal could be substituted for oil, if the latter increased in price and the price for steam power kept at its present level.

The outlook for a season of low rainfall was urged by the speakers as a further reason for adopting a plan that would have as its most essential feature early relief from present conditions. Speakers stated that a year of low rainfall would mean that the Antioch suit would be pressed, and that the litigation would not only disturb values but would impose a burden running into hundreds of thousands of dollars upon the litigants. The cost of the suit at the present time was said to total \$300,000.

THE FOOTHILL SITUATION

Representatives from a number of counties were present to discuss the coordinated plan as far as it affected the interests of counties with large bodies of mountain foothill lands.

Assemblyman R. E. Dillinger of Placerville urged the necessity of a water reservation for these counties sufficient to take care of the agricultural lands within their confines. Unless this was done, he declared that the time was coming when the foothill and mountaineers would find that their supply of water had been lost to them with nothing left for their own development.

The provisions of the so-called Dillinger bill were discussed at length. Mr. Dillinger stated that the bill provided for a maximum reservation of fifteen per cent of the water originating within any county. The actual reservation, he stated, was to be determined by the amount of land that could use water with profit.

D. Fricot of Calaveras County urged that the importance of an adequate supply of water for the development of the mineral, timber and other industrial resources of mountain counties.

Opposition was voiced by the representatives of mountain counties to the imposition of any time limit, during which water reservation, if made, would have to be used or its rights to use it in the county lost. It was contended that the valley areas used this water only when economic conditions made its use profitable, and that the same rule should apply in the case of mountain counties.

The importance of water in the streams of mountain counties as a recreational attraction was also urged. Members of the legislative committee are Assemblyman Bradford S. Crittenden, Tracy, chairman; Senators Ralph Swing, San Bernardino; W. R. Sharkey, Martinez; H. C. Nelson, Eureka; Edward A. Mueller, El Cajon; Assemblymen E. G. Adams, Livingston; Frank W. Mixter, Exeter; Van Bernard, Butte City.

Judge Luce Named to

San Diego Port Position

B. B. Meek, Director of the Department of Public Works, has appointed Judge Edgar A. Luce to the position of Surveyor of the Port of San Diego, effective March 1, 1928.

HOW STATE HIGHWAY FORCES MET DAM DISASTER

(Continued from page 22.)

Six of the thirty tetrahedrons, those located most centrally in the low water channel and which had become partially imbedded in the river bottom during a previous flow of water, were torn to pieces by the torrent, snapping and breaking the 12 foot by 12 foot heavily reinforced concrete legs of the tetrahedrons. Having their bases imbedded in the sand and being fastened to adjacent tetrahedrons with seven lines of one-inch cable, the six tetrahedrons were pulled apart as the fourteen tetrahedrons downstream from them were swept toward the river bank.

With six broken and the others badly displaced, the row of thirty concrete skeleton tetrahedrons came through the most tremendous flood that ever rushed down the river channel. They were constructed to prevent flood waters from cutting through the west approach to the bridge, and accomplished their purpose. The earth approach to the west end of the bridge was not damaged, the water being deflected by the tetrahedrons to its proper course under the bridge. Large quantities of brush and trees were collected by the protection work, and the area remaining between the row of tetrahedrons and the river bank and also on the stream side of the protection was silted up with about four feet of sand and gravel, thus straightening the channel and leaving conditions better than before the flood, as far as the river channel itself was concerned.

CALIFORNIA'S MESSAGE TO ARIZONA

(Continued from page 5.)

be so designed and built as to become a part of the colossal scheme of sculpture that was in the mind of the Creator when the earth was in the making. Beautiful bridges are an economic as well as an aesthetic asset. California and Arizona should never profane the majesty of their mountains by building any other kind.

I like to think of my work on the California Highway Commission in terms of bridges—prolonged bridges that reach out from either bank of the streams they span to the farthermost confines of our great state—and on and on across the borders of the state into Arizona and into Nevada and into Oregon—and on and on and on to the uttermost confines of the continent—and, in terms of time, on down through the ages.

In a magazine the other day I read a story of a governor who, being childless and stricken with fatal disease, sought reelection that he might build a beautiful bridge to perpetuate his name. And I thought of Stephen Gerard who, at 82 years of age said, "If I knew I should die tomorrow I would plant a tree today." Reaching back from the brink of the grave to place the germ of life in the womb of the earth! Truly a gallant and defiant salute to death!

REPORT TO GOVERNOR YOUNG ON CAUSES OF ST. FRANCIS DAM FAILURE

(Continued from page 7.)

the curved crest was 700 feet. The elevations above sea level at various points of the structure were as follows:

Crest of parapet.....	1,838.06 feet
Crest of spillway lip.....	1,835.00 feet
1st outlet upstream invert.....	1,799.00 feet
2d outlet upstream invert.....	1,763.00 feet
3d outlet upstream invert.....	1,727.00 feet
4th outlet upstream invert.....	1,691.00 feet
5th outlet upstream invert.....	1,658.26 feet
Bottom of maximum section.....	1,630.00 feet

Both faces of the crest of the dam were vertical for 23 feet. The downstream face of this vertical section was divided into panels 24 feet wide, of which eleven panels in two groups were spillways. Each spillway panel was 20 feet wide by 1.5 feet high clear inside dimensions. The five outlet pipes each 30 inches in diameter, were controlled by sliding gates fastened to the upstream face of the dam.

Storage of water in the reservoir began March 1, 1926. The approximate maximum storage for 1926 was 13,200 acre-feet at elevation 1779 on June 5. This level was maintained until about August 10, gradually lowered until October 5, and held thereafter at about 1762 until the end of the year. After January 5, 1927, the water was raised at a uniform rate to 1832 on May 10, where it was held until May 27. It was rather rapidly lowered to about 1817 June 20, and then with minor variations brought down to 1813 November 8, after which the level was raised to 1821 by December 31, 1927. From the beginning of 1928, when the water surface was 1821, storage was increased gradually until March 5, when the reservoir was practically filled to capacity of 38,000 acre-feet. The water level was maintained at 1834.75 or 0.25 feet below the spillway crest, until the time of the failure at 11.58 p.m., March 12, 1928.

Photographic evidence and the testimony of witnesses show that little seepage passed through the structure of the main dam. Certain cracks developed in the main structure, which possibly discharged an unimportant amount of water, as is not at all unusual in concrete dams. One or more cracks, with consequent unimportant seepage, also developed in the wing wall extension to the west of the main dam.

Much more important seepage is reported to have taken place through the foundation upon which the dam rested. As the water rose in the reservoir this foundation seepage appears to have increased to a maximum of between one and two second-feet on the afternoon preceding the failure. Rumors of muddy water seeping under or around the dam before its failure are in circulation, but the commission has been unable to verify them.

FAILURE OF THE DAM

It is reported that one of the caretakers was seen on top of the dam at 11 p.m. only an hour before the failure, and apparently up to this time there had been no alarming developments. The caretakers were lost in the flood, and so far as is known there is no living witness of the dam's collapse.

The first indication of failure, given by the automatic water register located on top of the central or standing section of the dam, was a gradually accelerated falling of the water surface, starting about 11.30 p.m. (corrected time) and aggregating about three-tenths of a foot at about 12 p.m., when the

failure was indicated on the record by a rapid fall in the water surface.

At 11.58 p.m. there was a break in the Borel transmission line of the Southern California Edison Company which was located in the canyon immediately below the dam. At 12.30 a.m., March 13 the power from the Los Angeles city power plant No. 2 in the canyon about one and a half miles below the dam went off.

It appears that the failure of the dam took place at, or slightly before, 11.58 p.m., March 12, when the main dam structure, with the exception of a section near its middle, failed completely, leaving the greater part of the left or easterly portion in very large fragments at and just below the dam site and great blocks of concrete up to about 10,000 tons in weight, chiefly from the right or westerly end, distributed for a distance of several thousand feet downstream.

The magnitude and violence of the wave released on the failure of this dam are hard to visualize even by engineers familiar with floods and flood conditions. The rush of water attained a maximum depth of about 125 feet in the deepest of four sections measured by the commission within three-fourths of a mile below the dam. In the vicinity of San Francisquito Power House No. 2, approximately 1.5 miles along the channel downstream from the dam, an even greater depth was reported. The flood wave completely carried away the heavy concrete power house down to the generator floor, together with the less substantial buildings occupied by the operators and their families. The flood followed down San Francisquito Creek 9 miles from the dam and then down the Santa Clara River 43.5 miles to the ocean. The velocity of the wave and the time required to reach the peak are data of great engineering interest. The following is a summary of these data now available to your commission:

Table of velocities of flood as noted at various locations downstream from the dam. Dam failure assumed at 11.58 p.m.

Location	Time of arrival of flood	Time of travel from preceding location	Distance in miles from preceding location	Velocity in miles per hour
Borel Power Line at Dam-----	11.58 p.m.	----	---	---
City Power Plant No. 2-----	12.03 a.m.	5 min.	1.5	18
So. Cal. Edison Co. Sub-Station near Saugus--	12.38 a.m.	35 min.	7.5	12.9
So. Cal. Edison Co. Construction Camp at Kemp-----	1.20 a.m.	42 min.	7.5	10.7
Fillmore Bridge--	2.25 a.m.	65 min.	12.7	11.7
Santa Paula-----	3.10 a.m.	45 min.	8.5	11.3
Saticoy Bridge--	4.15 a.m.	65 min.	6.8	6.3
Montalvo Bridge--	5.00 a.m.	45 min.	4.0	5.3

It seems probable that the flood peak immediately below the dam exceeded half a million second-feet and this, together with its occurrence in the darkness, and the suddenness and violence of the wave, was such that very few of the persons in the constricted valley below the dam escaped with their lives, though they were immediately adjacent to the safety of the steep slopes of the bordering hills. Even at a construction camp of the Southern California Edison Company, 16.5 miles below the dam, more than 80 out of about 140 perished.

The damage caused in the path of the waters 52 miles to the sea was very great. The record of known dead at this time is 236 and 200 are still missing. Fortunately no trains happened to be passing over

the railroad track inundated, and but few automobiles were on the many miles of highways destroyed. The total property loss of farms, orchards, small towns and public utilities will certainly be many millions of dollars.

METHODS FOLLOWED IN CONSTRUCTING THE DAM

The Los Angeles Bureau of Water Works and Supply placed at the commission's disposal a complete set of construction plans and photographs of the St. Francis Dam. By means of these, and by discussion of construction methods with Mr. Wm. Mulholland and several of his assistants, the essential construction data were ascertained.

The first step was the construction of a concrete wall 8 feet thick (narrowed to 5 feet at the top) and about 80 feet long at the bottom and 155 feet at the top, placed in a trench carried down into tight material under the stream bed to an elevation of approximately 1638. The foundation of the dam was then excavated behind the wall to elevation 1630 across the deepest part of the channel. It will be noted from these elevations that the foundation excavation of the dam was carried 8 feet below the bottom of the wall. The wall was built merely to cut off underflow through the gravel, and small freshets that might come from the San Francisquito drainage during the early construction stages, and convey these waters through a flume past the dam site. Behind this wall the lowest part of the dam foundation was excavated in the dry, and the wall itself finally incorporated into the upstream face of the structure.

The east wing of the dam was notched into the rock of the canyon wall and carried up the natural inclined plane of the rock in the abutment, without steps, and with no cut-off wall. Under portions of the west abutment and about 25 feet from the upstream face, a cut-off trench about 3 feet wide and 3 feet deep, probably with rounding bottom, was excavated longitudinally as deep as it could be carried by use of picks, and finished by prying out rock with gads. The nature of this trench can be observed by inspection of concrete surfaces on one large fragment from the west end of the dam that was carried downstream and now lies upturned showing the original contact with the abutment.

Relief of uplift that might be caused by water pressure underneath the dam was provided for only in the center, or the portion crossing the main channel. On a line about 30 feet in from the face of the dam, 3 holes were bored in line at intervals of 20 feet, while along a second line approximately 15 feet further downstream from the first line there were 7 more holes also at intervals of about 20 feet. The depth of these holes is variously reported to have been from 15 to 30 feet. A small section of pipe with collar was fitted into the top of each hole and cross connections were carried from these pipes to a center outlet pipe which was led out to the lower face near the lowest main outlet pipe. The amount of water draining from this system is understood to have been very small, and was carried down to the caretaker's house, where it was used for domestic supply, lawn watering, etc. Most of this drainage system is included under the portion of the dam which remains standing; this is probably merely a coincidence.

Construction views show that a relatively small cut-off trench was carried along the upper side of the wing wall extending westerly along the ridge from the west abutment of the dam. This trench was largely excavated by a steam shovel.

The concrete aggregate was pit-run sand and gravel taken from the stream bed between one-quarter and one-half mile below the dam, where aggregate used in

construction of the aqueduct and the San Francisco Creek power houses had been secured. The material was neither washed nor graded, but rocks in excess of 6 inches were excluded. It is stated that 1.12 barrels of Portland cement were used per cubic yard of concrete. Specimens deemed typical were taken and tested. These show a satisfactory quality of concrete.

No inspection gallery was carried through the dam, nor was any pressure grouting attempted under any part of the structure. Geological conditions not only at the dam site itself, but for a short distance above and for a considerable distance below, were clearly disclosed by the scouring that took place during the discharge of water from the reservoir.

GEOLOGICAL CONDITIONS AT THE DAM SITE

General Relations—The geological conditions in the vicinity of the St. Francis Dam are both simple and obvious. San Francisco Canyon here has a course of south 60 degrees west. The bottom of the canyon and the steep slopes southeast of the stream-way are carved from a fairly uniform mica schist. The gentler, less regular slope on the northwest side of the canyon is underlain by a reddish conglomerate, in rather ill-defined beds of great but undetermined total thickness. The contact between the two rocks is a fault which, at the dam site, has a strike that is approximately parallel with the course of the canyon and outcrops a short distance above the stream-way, on its northwest side. The dam consequently was placed astride of the fault, the southwest abutment and the foundation of the middle section being schist and the northwest abutment being conglomerate.

The fault is plainly visible as a sharp line that separates the lighter colored schist below from the darker conglomerate of the upper slope.

Mica Schist—The mica schist is an ordinary variety of this fairly common crystalline metamorphic rock. It consists chiefly of quartz, white mica and probably some feldspar. The schistose structure, due to the generally parallel orientation of the constituent minerals, particularly of the mica scales, is very well developed so that the rock has pronounced fissility or cleavage and splits readily into thin plates. As a consequence of this fissility also, the rock weathers and disintegrates into small flakes or scales.

In many places the schist has been strongly sheared, commonly along planes that are roughly parallel with the schistosity or planes of lamination. Along these shear-zones the rock has been changed to an exceedingly fragile flaky material that can be readily excavated with the pick. From a structural point of view such sheared schist is extremely weak material.

The general strike of the schistosity is from north 60 degrees to north 70 degrees east, or about parallel with the course of the canyon at the dam site. The dip is northwesterly. Consequently the lamination of the schist is not far from parallelism with the steep slope of the southeast side of the canyon. This slope, in fact, is conditioned in large part by the laminated structure of the schist. This same structure also is responsible in part for the landslides that have taken place since the dam failed.

The geological age of the schist is not definitely known. The rock, however, is probably at least pre-Cretaceous and may be pre-Cambrian.

The schist is not a soluble rock, nor is it ordinarily softened by wetting. It is capable of withstanding considerable pressure applied in directions approximately normal to its planes of lamination, but is very weak with respect to stresses applied in directions parallel with or at small angles with those planes.

Under such stresses the schist would slip like a pack of cards thrown upon a table.

Conglomerate—The conglomerate near the dam site strikes north 15 degrees west and dips 46 degrees west. It is composed chiefly of detritus derived from the schist terrane and from granitic masses that are not exposed in the vicinity of the dam. The pebbles, usually rather small and sparsely distributed, are embedded in a relatively large proportion of fine-grained, sandy, micaceous, flaky detritus derived from schist and granite. High above the dam site on the northwest slope of the canyon, can be seen rounded outcrops of the conglomerate that appear to be fairly well cemented and moderately resistant to erosion. At the dam, however, the rock has an entirely different character. As its peculiar properties at this place are at least in part a consequence of the faulting, previously referred to, they will be more fully described in connection with that feature.

The exact age of the conglomerate has not been determined, but it is Tertiary and probably Miocene (Mint Canyon formation) or Oligocene (Sespe formation).

San Francisco Fault—The fault which passes beneath the northwestern part of the dam site has long been known and is represented as a "dead" fault on the Fault Map of California compiled under the auspices of the Seismological Society of America. The present investigation shows that there has been no movement on this fault since the dam was built.

At the dam site, the strike of the fault is about north 51 degrees east, or approximately parallel with the course of the canyon. The dip, although variable, is generally between 30 and 45 degrees, to the northwest. At the dam site, a satisfactory exposure of the hanging wall of the slip gave a dip of 40 degrees. The same exposure showed striae that pitch 65 degrees to the northeast, indicative of a slip of which the vertical component.

Along the fault, next to the schist footwall, is a well-defined, dark, gray, clay gouge, which in places is at least 8 inches wide or thick. This material is chiefly comminuted or triturated schist—ground to clay by movement on the fault. When dry, the gouge is fairly hard, but when wet it is an unctuous, plastic, clay, with some enclosed fragments of schist. Under the gouge, in some places for a width of 10 feet, the schist is crushed and sheared. On the upper, or hanging wall side of the main slip-plane, is a reddish gouge, composed of ground-up conglomerate. This gouge is generally thicker than the gray gouge and grades rather indefinitely into disturbed, crushed conglomerate. When dry, this material is firm and coherent, but becomes soft and plastic when wet. In places, this reddish gouge is fully 4 feet thick.

Above the foregoing material, as the slope is ascended, and extending all the way up the northwestern abutment to the top of the dam, the conglomerate is traversed in various directions by intersecting fractures, some of which contain small seams of clay gouge, and others are filled with gypsum. The pebbles in the conglomerate have, in many instances, been fractured, sheared and faulted. Finally, the whole mass of the conglomerate has been so minutely crushed as to have lost most of the strength to be expected in a rock possessing its general appearance. When dry, the rock is moderately hard and fragments of considerable size can be broken out and trimmed down with a hammer to specimen size. When, however, a piece of the rock is placed in water, a startling change takes place. Absorption proceeds rapidly, air bubbles are given off, flakes and particles begin to fall from the sides of the immersed piece, the water becomes turbid with suspended clay and,

usually in from 15 minutes to an hour, a piece of the size of an orange has disintegrated into a deposit of loose sand and small fragments, covered by muddy water. Whatever may have been the original cementing material of the conglomerate, its efficiency has been destroyed by crushing, aided possibly by solution, and the rock at present is held together merely by films of clay. It is possible that this part of the conglomerate, as originally deposited, contained considerable clay that never became lithified.

This remarkable characteristic of the conglomerate is probably local and confined to a belt within some undetermined distance from the fault. The rounded outcrops previously referred to as appearing higher up the slope could scarcely exist if the conglomerate at that distance from the fault were equally susceptible to the disintegrating effect of water.

That the same process of disintegration above described was going on rather extensively where the conglomerate was covered by the water of the reservoir, is clearly shown by the character of the residual material left on the conglomerate where the escaping water has not cleaned off all of the surface material.

Clearly, when thoroughly wet, the conglomerate at the northwestern abutment of the dam ceased to have the characteristics commonly denoted by the term rock.

Whether the movement on the fault was normal or reverse is not known. The fact that the conglomerate is obviously younger than the schist suggests a normal fault, although the rather low dip and the condition of the conglomerate in the hanging wall are indicative of overthrust.

Major Earth Movements—A careful examination of the contact fault in the vicinity of the dam site shows no evidence of recent movement. According to Mr. H. O. Wood, in charge of the Seismological Laboratory of the California Institute of Technology, Pasadena, their seismographs recorded no earth tremors of even slight intensity at any time near the time of the dam failure.

There appears to be no reason to believe that faulting or other major earth movement was to any degree responsible for the failure of the dam.

Landslides—The mica schist which occupies the southeast side of the canyon shows separation planes along the schistosity, and shear surfaces dipping northwesterly at 30 degrees and more. The canyon slopes are steep and approximate the dip of the schistosity and shear surfaces. Landsliding is therefore always imminent and may be produced by any one of several causes.

Above the dam site several marked recent slides have taken place. One, a short distance upstream from the dam, broke the road and carried a large mass of rock and earth down to the floor of the valley. A careful examination of the surface of this slide shows no water lines, erosion furrows, or other evidences of the action of the standing or moving water of the reservoir. Evidently the sliding occurred after the withdrawal of the water from the reservoir. The added weight of the infiltrated water while the reservoir was full, and the rapid removal of the water support when the dam failed are sufficient causes for the landslides above the dam.

At the east abutment of the dam and immediately below the dam site much recent sliding has taken place, and during the visits of the commission to the dam site a continuous rain of rock fragments was coming down the slope, accompanied by clouds of dust. This sliding is evidently due to the removal of support as a result of the destruction of the dam and the undercutting of the slope by the waters released by the dam failure.

Smaller landslides and slumps are found along the slopes above the wing wall. These clearly followed the withdrawal of the water from the reservoir and were due to the removal of support from the water-soaked and softened outer portions of the conglomerate.

It is concluded that all of the recent landslides in the vicinity of the dam site took place after and as a result of the failure of the dam and were in no way responsible for such failure.

CONDITIONS AT THE DAM AFTER FAILURE

The wrecked westerly part of the dam from a point 70 feet west of the standing section to the end of the wing wall, as well as the wing wall that still remains, was founded on the conglomerate. Eastward from the base of the conglomerate across the stream bed and up the east side of the canyon the structure rested on schist. The contact between the conglomerate and schist is along a fault plane that shows considerable ancient movement. Water rushing through the westerly break in the dam has scoured both conglomerate and schist to a considerable depth, the principal part of the scouring taking place toward the toe of the dam, probably due both to the character of the material at this particular location and to the fact that a ridge just upstream from and practically parallel to the face of the dam acted as a submerged weir over which the water poured onto the downstream part of the foundation. To the westward of the standing section and against its base a narrow channel was cut through the schist to a depth well below all of the concrete in the structure, with the exception of the concrete coffer dam sections at the upstream face and a thin section carrying the steps on the downstream face. It is therefore possible to observe the character of the material which underlain that part of the dam.

To the eastward of the standing section the water carried away a large amount of the schist not only on the side of the canyon or along the abutment, but in the bottom. Probably due to combined effect of water soaking and undercutting, a very large and conspicuous slide has developed on the hillside on approximately the line of the eastern abutment. Material was still cascading down the face of this slide 10 days after the failure, and from observation in the field it is apparent that the slide movement will continue for some time.

The distance to which large masses of concrete from the dam have been transported is probably one of the most impressive phenomena of the disaster. All of the fragments from the westerly side of the dam have been carried some distance downstream. Many of the large fragments from the easterly side have moved only a short distance out of place and now rest against the base of the standing section, but several very large masses of concrete from this side have been carried downstream as far as the large masses from the westerly end, being recognizable from the inclusions of schist upon which they rested. One large mass from the west side is turned bottom up and the foundation material adhering to it shows that it came from the part of the dam directly over the contact between the conglomerate and the schist.

Discharge of water from the foundations and from seeps along construction joints in the concrete of the standing section and in the masses washed downstream was very noticeable immediately after the break, when the site was inspected informally by several members of the commission, but had markedly decreased during the few days that intervened before the commission assembled and during the time that its investigations were under way. The most notice-

able discharge was from the seams in the conglomerate about on a line between the standing section of the dam and the broken end of the wing wall, and about two-thirds of the way up the abutment from the bottom. Very noticeable seeps occurred along the top of the gouge between the schist and the conglomerate.

A short length of the two-inch pipe that formed part of the drainage system along the second line of holes drilled under the dam is now protruding from the large slab of concrete that has broken away from the easterly end of the standing section. That is the only part of the drainage system that can now be identified.

The rapid lowering of the water in the reservoir caused several large landslides that are very conspicuous as shown in pictures looking upstream from the dam site. The most important of these is on the easterly side of the reservoir a short distance upstream from the dam, where displacement of a road shows vertical movement of approximately forty to fifty feet along the junction of surface earth and material that is probably very similar to that against which the east abutment of the dam rested.

Seepage from the water-soaked slopes of the reservoir basin has contributed a considerable but constantly decreasing stream ever since the break, and four days after the disaster amounted to 15 second-feet.

Triangulation between stations established during construction and the tying in of one fixed point that has moved S. 2° 52' W. 0.70 feet. The course of the radius at this point was N. 51° 22' E. It is yet uncertain whether this movement is due to tilting, to horizontal displacement of the whole mass, or to a combination of the two. The surface of the conglomerate on the westerly abutment, shortly after the break, showed marked softening due to water soaking. After a few days drying this material showed clean smooth surface when broken, and some of the hardest specimens rang under the hammer. Many of these, however, go to pieces when immersed in water for a few hours, and samples taken over a considerable area have gone to pieces almost immediately upon immersion. Material from the gouge along the fault between the conglomerate and schist rapidly becomes soft and unctuous when immersed. An attempt was made to prepare two samples of the conglomerate for compression and absorption tests. One broke in preparation, and the other stood only 523 pounds per square inch in compression when dry. See reports from the testing laboratory included as Appendices.

CAUSES OF THE FAILURE

The St. Francis Dam was designed with a gravity section and was arched in plan. Experience has shown that this type of structure is preeminently safe and it is generally accepted by engineers all over the world as a conservative design.

The material in the dam is demonstrated by inspection, by tests, and finally by the behavior of enormous blocks remaining from the wreck, to have been of satisfactory quality and adequate strength. Tests of samples cut from typical blocks showed an average crushing strength of about 2400 pounds per square inch, which is much beyond any stresses to which it could have been subjected under normal conditions.

There were no contraction joints built in the dam, which is the case in many existing dams, and, in any event, the failure can not be attributed to their absence.

There can be no question but that such a dam properly built upon a firm and unyielding foundation would be safe and permanent under all conceivable

conditions, except perhaps faulting and earthquake shocks of tremendous violence. Indeed such a dam may properly be deemed to be among the most durable of all man-made structures. Unfortunately in this case the foundation under the entire dam left very much to be desired. The material under the central and left, or easterly, end was a mica schist of thin and easily separable laminae. The west end was founded upon a reddish conglomerate which, even when dry, was of decidedly inferior strength and which, when wet became so soft that most of it lost almost all rock characteristics. Numerous samples taken from the present surface which has been eroded to a considerable depth below the original foundation and some samples from underneath the remaining west wing wall, quickly softened and changed into either a mushy or granular mass when immersed in water. Unfortunately this material is of such a nature that when entirely dry it is hard and rock-like in appearance and characteristics, although defective in compressive strength. Of two samples taken from the firmest part of the eroded foundation, one broke in preparation for testing and the other, cut into a 5.77-inch cylinder 7.12 inches long, showed a compressive strength of only 523 pounds per square inch, or between one-fourth and one-fifth that of the concrete in the dam. Greater strength might have been shown had the sample not been moistened by exposure at the time of the dam failure, but on the other hand it would have been much weaker with a larger moisture content.

With such a formation, the ultimate failure of this dam was inevitable, unless water could have been kept from reaching the foundation. Inspection galleries, pressure grouting, drainage wells and deep cut-off walls are commonly used to prevent or remove percolation, but it is improbable that any or all of these devices would have been adequately effective, though they would have ameliorated the conditions and postponed the final failure.

While as yet the manner and chronological order in which the failure of various sections of the structure occurred are not entirely certain, the present locations of the fragments from the west end indicate this as the point of initial failure which was quickly followed by progressive but rapid failure of the east end. Many of the available data indicate that the initial foundation failure occurred near or at the old fault or contact between the conglomerate and schist under the west end, and was due to the percolation of water into and through this section of the foundation, with resulting softening of the conglomerate under the dam. Either a blowout under, or a settling of the concrete at this place, or both, occurred, quickly followed by the collapse of large sections of the dam.

It is probable that the rush of water released by failure of the west end caused a heavy scour against the easterly canyon wall at the toe of the dam. This rapidly cut away the schist including the material under the toe of the east part of the dam and caused the failure of that part of the structure. The escaping water then continued to cut away the schist from the east wall of the canyon until a maximum depth of about 30 feet below the original foundation level was reached.

A fact which should be very reassuring as to the stability of a gravity dam on reasonably sound bedrock is that although the central section still standing must have been exposed to tremendous and sudden stresses amounting to shocks, while still subject to practically full water pressure, it is undisturbed except from an apparent movement at the top of some 5.5 inches downstream and 6 inches toward the easterly abutment.

The record made by the Stevens gage which was located on the standing middle section of the dam is shown. Using this record in connection with the known areas and capacities of the reservoir at varying water elevations, the following table has been made:

Discharge from St. Francis Reservoir, deduced from copy of chart from automatic water stage register located on top of the portion of the dam that remains in place. The absolute time is obviously in error.

From	Time interval To	Drop in water surface, feet	Discharge, C.F.S.
2 p.m.	March 12, 1928		
	12 midnight	0.03	22
	March 13, 1928		
12 midnight	12-06 a.m.	.01	740
12-06A	12-14A	.04	2,200
12-14A	12-20A	.05	3,680
12-20A	12-24A	.05	5,520
12-24A	12-26.7A	.05	8,160
12-26.7A	12-29A	.05	9,600
12-29A	12-30.5A	.05	14,700
12-30.5A	12-31.5A	.05	22,000
12-31.5A	12-32.2A	.05	31,500
12-32.2A	12-33.4A	.10	36,700
12-33.4A	12-34.3A	.10	48,900
12-34.3A	12-34.9A	.10	73,300
12-34.9A	12-35.3A	.10	110,000
12-35.3A	12-35.5A	.10	220,000
12-35.5A	12-35.65A	.10	293,600
12-35.65A	12-35.75	.10	438,300

Too much reliance must not be placed upon this, as the horizontal or time scale of the record is very small and the accuracy of the clock movement is not certain. However, for at least many hours before the record ends there clearly were not water surface fluctuations except a lowering beginning about 2 p.m., which was so slight that it might have been due to upstream wind movement.

This record shows that a water subsidence which could not have been due to upstream winds began about one-half hour before the flow from the reservoir reached enormous proportions, and further, that the curve of emptying is regular up to that point. Such accelerating water lowering, as opposed to an abrupt fall, is apparently contradictory to many data reported as to suddenness of the downstream movement of the flood wave, especially at Power House No. 2, where there appears to have been no such warning as would have been given by a gradually increasing stream flow such as would have resulted from anything like the deduced record given in the table.

In so far, however, as the validity of this record is accepted, the discharge of the impounded waters was something like that given in the table.

CONCLUSIONS

1. The failure of St. Francis Dam was due to defective foundations.

2. There is nothing in the failure of the St. Francis Dam to indicate that the accepted theory of gravity dam design is in error or that there is any question about the safety of concrete dams designed in accordance with that theory when built upon even ordinarily sound bedrock. On the contrary, the action of the middle section which remains standing even under such adverse conditions is most convincing evidence of the stability of such structures when built upon firm and durable bedrock.

3. The failure of this dam indicates the desirability of having all such structures erected and maintained under the supervision and control of state authorities. Water storage, with its necessary concomitant dams and embankments, is peculiarly essential to the development of California resources, and in the great majority of cases failures would result in serious loss of life and property. This disaster emphasizes the

fact that while the benefits accrue to the builders of such projects, the failures bring disaster to others who have no control over the design, construction and maintenance of the works. The police power of the state certainly ought to be extended to cover all structures impounding any considerable quantities of water.

Respectfully submitted.

A. J. WILEY, Chairman, Boise, Idaho.
Consulting engineer.

GEO. D. LOUDERBACK, Berkeley, California.
Professor of Geology, University of California.

F. L. RANSOME, Pasadena, California.
Professor of Economic Geology, California Institute of Technology.

F. E. BONNER, San Francisco, California.
District Engineer, U. S. Forest Service and California Representative Federal Power Commission.

H. T. CORY, Los Angeles, California.
Consulting engineer.

F. H. FOWLER, San Francisco, California.
Consulting engineer.

March 23, 1928

REPORT OF COMPRESSION TEST OF ROCK

Test made for: Commission appointed by Governor Young to investigate failure of St. Francis Dam.

Description of specimen: Cylindrical core, 5.77 inches diameter, 7.12 inches high, cut from sample selected by the Commission at the dam site; core was cut by L. A. County Road Department in presence of Mr. Perkins and a representative of the laboratory. No water used in coring this specimen.

LABORATORY DATA

Test number, 17857.
Specimen mark, R.B.
Weight, total lbs., 15.21.
Weight, per cu. ft., lbs., 150.60.
Specific gravity, 2.414.
Average diameter, in., 5.77.
Average height, in., 7.12.
Area, sq. in., 26.14.
Compressive strength—
Total lbs., 14,570.
Lbs. per sq. in., 557.
Corrected to standard specimen—
Lbs. per sq. in., 523.

REMARKS—Height divided by diameter is 1.23, correction made by multiplying crushing strength by 0.94 (according to American Society for Testing Materials) Standard method for securing specimens of hardened concrete from the structure, Serial Designation C12-27; Character of fracture—conical.

After coring, specimen was given three coats of shellac to prevent absorption of water during test for specific gravity. The smaller specimen of stone submitted, fractured during the coring process. A test for rate of absorption was made on a portion of this specimen and the following results were obtained:

Total time elapsed	Per cent absorption by weight
10 minutes	0.59%
20 minutes	.67%
30 minutes	.69%
40 minutes	.71%
50 minutes	.73%
1 hour	.73%
1 hour 10 minutes	.75%
1 hour 20 minutes	.75%
1 hour 30 minutes	.77%
1 hour 40 minutes	.77%
1 hour 50 minutes	.79%
2 hours	.79%
2 hours 30 minutes	.79%
Total porosity	2.25%

In making the above test, the rock was broken up into pieces passing a 1½-inch ring, and placed in a bottle of water; each piece was carefully brushed to

remove loose particles; the total sample weighed 503.6 grams dry. At the end of 20 minutes the samples had disintegrated in a very marked way, and a layer of sand about three-eighths of an inch deep was formed on the bottom of the bottle.

The absorption was measured by adding small amounts of water to keep the total volume constant, and the total porosity was obtained by evacuating the sample in the bottle.

Respectfully submitted.

RAYMOND G. OSBORNE LABORATORIES.

By S. S. STAHL, (Signed).

March 23, 1928

REPORT OF COMPRESSION TESTS OF CONCRETE.

Tests made for: Commission appointed by Governor Young to investigate failure of St. Francis Dam.

Description of specimens: Cylindrical cores approximately six inches dia. cut from blocks of concrete selected by Commission at dam site; cores were cut by L. A. County Road Department, in presence of Mr. Perkins, and a representative of the laboratory.

LABORATORY DATA

Test number -----	17854	17855	17856
Specimen mark -----	1	3	4
Age -----	About 2 years	2 years	2 years
Weight, total lbs. -----	23.23	27.58	25.45
Weight, per cu. ft., lbs. -----	137.4	142.8	141.7
Specific gravity -----	2.202	2.289	2.271
Average diameter, in. -----	5.89	5.85	5.85
Average height, in. -----	11.50	12.50	11.75
Area, sq. in. -----	27.25	26.88	26.88
Compressive strength-----			
Total lbs. -----	69,810	53,940	73,020
Lbs. per sq. in. -----	2,562	2,007	2,717

CHARACTER OF FRACTURES—

Specimens 1 and 3 failed in planes nearly parallel to the axis of the specimen. No. 4 showed a partly conical fracture; Specimen No. 3 contained a spherical piece of soft conglomerate (?) about 2½ inches in diameter and one large piece of laminated stone probably mica schist. Specimen No. 2 broke off which revealed a large laminated stone, which rendered the core unfit for testing. The specific gravity of this stone was 2.705.

REMARKS:

To expedite completion of tests, specimens were all tested as received, that is, air dry except for some water absorbed during the coring process.

Tested in Olsen Universal Testing machine; speed of moving head—.05 inches per minute.

Tests witnessed by Messrs. Wiley, Bonner, Hyatt, and Perkins.

Respectfully submitted.

RAYMOND G. OSBORNE LABORATORIES.

By (Signed) S. S. STAHL.

Community Thanks

District Engineer

Calaveras County Snow Frolic held at Big Trees on January 15th was well attended. The road was opened by the Division of Highways in order to make it possible. The following resolution was passed by the Angels Boosters Club on January 17th.

"Be It Resolved, That Mr. R. E. Pierce be conveyed a vote of appreciation and thanks for his whole-hearted cooperation and generous services rendered us in making the second Booster Snow Frolic the success that it was.

Grandma—"Oh Jenny, darling. I am surprised! Aren't you going to give your brother part of your apple?"

Jenny—"No, Grannie. Eve did that and she's been criticised ever since."

SOLVING SAN FRANCISCO'S ROAD PROBLEMS

(Continued from page 9.)

Hill, and at Castro Hill near Hayward have been completed and rock placed on a one-mile section at the Hayward end, thus completing all heavy grading on the present road and leaving most of the incomplected heavy grading on line changes where it can be done without interfering with traffic and allow of completion of the three large bridges. The road is open to eastbound traffic and cutting of points and making of side fills can progress until the weather breaks for spring, when the second part of the program will be taken up to allow of opening up of the new road to the heavy summer tourist traffic.

RECONSTRUCTING ROAD

As the traffic increases between the East Bay cities of Oakland, Alameda and Berkeley and the city of San Jose and southerly points, it is becoming increasingly apparent that this highway on the east side of San Francisco Bay is inadequate. This route is being reconstructed where traffic and disintegrated pavement conditions require. The portion from Milpitas to San Jose, having been completed in 1926, the 4.38-mile section between Warm Springs to Milpitas is now under contract to the Allied Contractors, Inc. and is nearly complete. The 11-foot concrete shoulder widening on one side is complete and the 18-foot asphaltic surface will be complete early in March and it is expected that by the middle of March the entire project will be open to traffic.

NEW METHOD USED

A new method of spreading asphalt mixture was used on the latter half of this job. An Ord mechanical surfacer specially built with forward screed for primary leveling, intermediate set of narrow teeth for raking and a rear screed for smoothing, was used instead of hand rakes in preparing for the roller. A very satisfactory smooth surface is being obtained which would indicate a successful future for mechanical finishers in asphaltic work.

Writes Up California Highways

The Cornell Civil Engineer of January, 1928, contains a very interesting article on the California state highway system. The article was written by Wm. F. Faustman of the engineering department of the Division of Highways, and a graduate of Cornell with the class of 1907. The article gives a very clear account of the California highway organization.

Traffic Recommendations of Supervisors

THE following report and recommendation was unanimously adopted by the County Supervisors Association of the State of California, held in the city and county of San Francisco on March 7, 1928.

Your committee of engineers appointed in October, 1927, to report to you upon truck weights and regulations, herewith present their report.

The committee consists of R. M. Morton, former State Highway Engineer, Chairman; E. E. East, Chief Engineer of the Automobile Club of Southern California; C. C. Cottrell, Manager, Highways Bureau, California State Automobile Association; Harry H. Hume, County Road Engineer, Butte County; Lloyd Bowman, County Surveyor, Santa Cruz County; Chris P. Jensen, County Surveyor, Fresno County; and George W. Jones, Road Commissioner, Los Angeles County.

In addition to continuous individual study of the various subjects, the work of the committee has included several sessions held at San Francisco, Los Angeles and Fresno, at which various interested firms and individuals presented arguments relating to the various phases of the subject.

TESTS

The subject assigned to the committee could very properly be investigated in great detail. The matter of static weights and increase due to driving torque, impact on road surfaces and bridges, stresses in pave-

ment slabs of various designs and thicknesses, merit thorough research study to determine conclusively, from an engineering viewpoint, the accurate answers to the questions of greatest interest in the minds of the supervisors. The opportunity for such tests obviously was not afforded to this committee, either in time or in funds. Such tests, to be of value, should be carefully conducted by research specialists.

Without the benefit of authentic tests conducted under California conditions, the committee has been compelled to proceed according to results of such tests as are available which have been conducted elsewhere, and in accordance with engineering principles, plus a measure of common sense.

With a testing organization such as we have in mind functioning with proper facilities and financial support from the motor vehicle license receipts, decisions of expediency and special interest influence in legislation would pass into the discard, and our future motor vehicle legislation could be based upon sound economic and engineering principles.

Recommendation—A properly equipped research testing laboratory be authorized and financed under the direction of the proper state agency, to acquire engineering data pertaining to the operation and effect of vehicles on highways.

ENFORCEMENT

It is the opinion of your committee that regulations are of little or no value unless properly enforced.

(Continued on next page.)

COMMUNICATIONS

Urges Importance of Ocean-to-Ocean Roads

Los Angeles, Cal.,
March 1, 1927.

EDITOR CALIFORNIA HIGHWAYS AND PUBLIC WORKS:

Strange to say we daily hear of highway construction, the progress and the great necessity, also the vital advantages, yet we hear nothing of the most important and vital link in it, meaning a national ocean-to-ocean highway. Strangely, the auto clubs, State Highway Commission, public officials and authorities and all official organs of the aforesaid are silent on this topic.

Today we have the spectacle of the richest, greatest nation on earth, with its citizens ploughing their way through hundreds of miles of unpaved roads, or poorly paved, to the destruction of auto, the nerve system and the spinal column, whilst thousands of people are out of employment. We with the vastest supply of men, material and money, have no National Highway, where we should have two, one north, one south; great paved roadways, say fifty feet wide at least, for pleasure, business, preparedness. Why such inefficiency, why such false economy, why such inexcusable lack of ordinary business sense?

Is it possible that ulterior motivated influence holds

off this vital improvement; is it the same selfish, jealous crew that for decades held back the Panama Canal, that has aborted a great system of internal canals, that allowed the Mississippi Valley to fall victim to a world catastrophe, namely the national railroad interests, which do not, but should belong to the people, and thus prevented from casting monkey wrenches into needed public enterprises? Private monopoly all too often strangles and smothers public improvements until they can dominate them for their own exploitation. Is railroad influence smothering national highways?

It is the bounden duty of all public officials, auto clubs and the press to hammer on ocean-to-ocean highways until we get them.

Anything less is plain treasonism to a public duty; there exists no excuse for delay; the present situation is a disgrace and a menace to the nation.



C. H. V. LEWIS.

CHARLES H. V. LEWIS,
Senator, Thirty-eighth District.

TRAFFIC RECOMMENDATIONS OF SUPERVISORS

(Continued from page 32.)

By far the great majority of the commercial users of highways have a desire to comply with all regulations which are put into effect. There is, however, another group who endeavor by every device and trick of the trade to evade traffic regulations and requirements. It is for this minority that enforcement machinery must be set up, and it is for them that there must be certainty of punishment, if it is to be effective.

Consideration of truck weights and regulations immediately points to the necessity for uniform enforcement. The system of enforcement at present employed in this state is not as satisfactory as is needed, in that there is a lack of uniformity between the various counties and between the counties and the cities. Both truck operators and motorists alike become familiar with the different importance placed upon certain infractions in various communities, and there is a tendency toward a general disregard of the restrictions which we now have. It is useless to add to or modify the restrictions of the Motor Vehicle Act without placing the enforcement machinery in full repair. It appears to us highly desirable that regulations should be uniform throughout the state. Trucks can travel up to 300 miles in a single day. In so doing they pass through many different communities. Under present conditions it is impossible, without full control being vested in some central administrative head, for enforcement to be uniform.

The disadvantages of the present dual control are well known. The officers are usually local residents, and inasmuch as they are paid out of funds which would otherwise come to the county, they are really paid by the county, although the funds are actually handled by the Motor Vehicle Division. The local governing bodies influence the officers, for under the present system they can reduce or increase the number of officers as they see fit. This influence is not always in harmony with the policies of the Motor Vehicle Division and such a situation is demoralizing to the personnel.

Officers can not be readily transferred from one locality to another under the present system, thus preventing the Motor Vehicle Division from distributing the forces throughout the state to the best advantage.

The existing discretionary right of the courts in the matter of fixing fines constitutes an encouragement for influential violators to use every means possible of evading the penalties. Such evasions make impossible a uniform law enforcement, if for no other reason than the discouraging influence upon the traffic officers themselves.

We see no reason why minimum penalties should not be specified, of a sufficient amount to constitute a deterrent.

Some motor vehicle operators consider that it is a distinct financial gain to themselves to evade some of the present regulations, and repeatedly pay the fines that might be imposed upon them under the present provisions of the Motor Vehicle Act.

Your committee has discussed different methods by which the existing dual control might be eliminated, and are insistent that adequate enforcement is the most vital modification needed. However, it is outside our province to specify and recommend to your honorable body the exact manner by which improvement of present methods should be accomplished.

Recommendation—(a) That a manner of uni-

form enforcement of the provisions of the Motor Vehicle Act be put into effect which will secure a greater degree of compliance with these provisions.

(b) That minimum penalties be specified, of a sufficient amount to constitute a deterrent.

FOUR-WHEEL TRUCKS

Your committee has no quarrel with the present weights permitted on motor vehicles. The maximum gross load of 22,000 pounds on a 4-wheel motor vehicle as it now stands in the law appears to us reasonable from every viewpoint. It has been agreed upon as a result of modifications in legislation over the past six years. We do not find the commercial haulers dissatisfied with it, and we are unable to agree with the view that this weight is destructive to improved roads.

Truck hauling is an essential part of our economic life. The delivering of commodities from factory or farm to their market, with the speed and convenience afforded by trucks, results in a saving reflected to every individual in the state. The highways and the trucks are the logical extension and supplement of the railroad lines. To bar reasonably loaded trucks from our highways would seriously impair the existing economic structure to a greater extent than the small benefit which would accrue from preventing some road damage.

We incline to the view that the building of highways, for whatever purpose, entails upon the public the duty of expending sufficient money to insure improvements of practical value, under reasonable restrictions, for all reasonable types of transportation.

A reasonable attitude towards economical transportation requires that a reasonable load be permitted. A 22,000-pound load permits the hauling of 5 to 6 tons on the average 5-ton truck, which net load is in accordance with the manufacturer's rated capacity. To disturb this figure would have far reaching and disastrous effects on the truck industry as well as on our economic structure.

Recommendation—That the maximum gross load to be permitted on a motor vehicle having four wheels shall be maintained at 22,000 pounds.

SIX-WHEEL TRUCKS

It has been established through tests conducted by disinterested agencies that with the same load, the placing of additional sets of wheels under a 4-wheel motor vehicle lessens the wheel pressure on the road and the impact on the road surface. It is therefore logical that this reduction should permit an increase in the load. No increased menace to road improvements is presented except to bridges, with an increase of 12,000 pounds in the total load, and assuming that the original 4-wheel vehicle weighs 22,000 pounds gross.

We realize the menace which this increased load presents to the older and more obsolete bridges, but the improvement of our highway surfaces has advanced farther than the modernizing of our bridges. They constitute extremely important links in our system of communication, and we can not postpone a policy of bringing obsolete bridges to a condition equally strong as our road surfaces. We believe it to be the duty of public officials to arrange for repairing or rebuilding weak bridges in accordance with the modern standards required by modern traffic. The greater transportation economics resulting from a larger load on 6-wheel motor vehicles justify this increased outlay of public funds.

Recommendation—That the maximum gross load to be permitted on a motor vehicle having six or more wheels, or on any other vehicle, shall be 34,000 pounds.

SIX-WHEEL TRUCK DEFINED

Since the Motor Vehicle Act was amended in 1923 to permit a gross load on 6-wheel vehicles of 34,000 pounds, it has been demonstrated that a definition is needed of what is to constitute a 6-wheel vehicle. Due to the lack of suitable definition, a considerable industry has sprung up for the placing of additional axles under trucks originally built with two axles. You are all familiar with some phase of this situation and have seen the various devices masquerading under the guise of an additional axle, by means of which the addition of 12,000 pounds of load is justified under our present law. The obvious intent of the legislature in permitting a 6-wheel vehicle to carry additional load was that the load should be equally distributed between the major axles at the rear of the motor vehicle, for it is only in this way that abuse of the additional axle privilege can be prevented.

We have examined many designs submitted to us, and find that there are inherent difficulties which prevent a uniform distribution of the load between the main axle and the attachment. The load on the main axle can not be reduced below a certain amount and taken up on the idler, because of loss of traction. A large proportion of the weight of the rear of the truck must be on the traction wheels. Therefore, all of the 6-wheel attachments provide for the distribution of the additional axle of only the minor portion of the load.

Some of the devices in use are so complicated that the inertia of the movable parts in passing over an obstruction would prevent the additional axle from taking the load for which it was designed. Others are in daily use which permit the additional axle to be drawn up and held free from the ground at the will of the operator, so that all the load will be on the traction wheels.

That abuses such as these should be countenanced is inconceivable. Before these industries grow to larger proportions, a specific definition of a 6-wheel truck should be written into the law. The only proper definition is one which will compel an equal distribution of the load on all four rear wheels, to be accompanied by equal driving capacity through both rear axles.

Recommendation—That on motor vehicles permitted to carry a maximum gross load of 34,000 pounds, additional axles shall be spaced not closer than 42 inches to the adjacent axle. The maximum axle load for such vehicles shall not exceed 14,000 pounds and the maximum wheel load shall not exceed 7,000 pounds.

MULTIPLE AXLE TRAILERS

Another abuse not anticipated when the law was modified in 1923 is created by the manufacturers of trailers. Trailers are constructed and in use on the highways on which loads up to 100,000 pounds can be carried. This is done by the setting of short axles, with a wheel on each end, in the same transverse place across the body of the vehicle. For instance, in the same plane, there are in some cases, as many as three axles and six wheels. Under the present wording of the act, these vehicles can not be considered illegal if the weight on each wheel does not exceed 9,000 pounds, the weight on each axle 18,000 pounds, if sufficient width of rubber is provided to keep the weight per inch width to 700 pounds or less. However, public highways can not be expected to

carry such unreasonable loads, and they should not be permitted. Prevention of the occasional moving of the loads for which these trailer vehicles are built would not interfere with the economic structure dependent upon truck transportation.

Recommendation—It is our recommendation that motor vehicle or trailer axles placed on transverse planes, which are closer together than 42 inches shall be considered as one axle.

AXLE LOADINGS

From all the evidence produced before our committee, we do not find that the operation of a 4-wheel truck with a gross load of 22,000 pounds requires an axle limit as high as 18,000 pounds. The limitation of axle loading on a 4-wheel truck should be reduced to 16,000 pounds, with 8,000 pounds permitted on each wheel.

Recommendation—That the maximum axle loading on a 4-wheel truck be reduced from 18,000 pounds to 16,000 pounds, and the maximum wheel loading be reduced from 9,000 pounds to 8,000 pounds.

TRAILERS

It is not practicable to apply to trailers the same principles of load distribution that are recommended for application to motor vehicles. We find considerable abuse in the use of trailers.

There are limitations in the design of motor vehicles which compel the manufacturer to allow for a large proportion of the load on the rear. This is done in order to obtain traction, brake action, etc. Trailers with four wheels and two axles should be permitted to carry the same load as 4-wheel motor vehicles. However, just as soon as a trailer becomes a vehicle with six or more wheels, complications arise regarding the distribution of the load between the axles, and the location of the additional axles. Load distribution between the axles of a trailer is impractical to enforce and depends upon how the live load is adjusted. On a motor vehicle, the load distribution is dictated by design limitations.

Recommendation—That the maximum gross trailer load shall not exceed 22,000 pounds, the maximum load on any trailer axle not to exceed 16,000 pounds, and on one wheel 8,000 pounds.

INCREASED SPEED FOR TRUCKS

Under the present law, vehicles on pneumatic tires, weighing less than 18,000 pounds, are permitted the regular touring car speed of 40 miles per hour. Under this section the heavy stages operate.

There is probably no provision of the Motor Vehicle Act which is so largely violated as that which limits the speed of heavily laden trucks on solid tires, and these violations account for most of the damage to highway improvements.

It is well known that the cushioning effect of pneumatic tires minimizes the destructive effect of heavy loads, but on account of greater operation costs the industry should be further encouraged to discard the destructive solids in favor of pneumatics.

The essential element of relief of traffic congestion is to keep the traffic moving at a rapid rate. This is also essential to reduction in transportation costs. It therefore seems desirable to your committee that less drastic speed limitations should be imposed on heavy truck transportation, when handled by equipment less destructive to the highway.

There is a glaring inconsistency in the present act in permitting a gross load less than 18,000 pounds, on pneumatic tires, to travel at touring car speed, and then restricting a load of 18,001 pounds, on the

same tire equipment, to a speed of 20 miles per hour. The benefit to highways and to economic transportation which will accrue from increasing the present speed restrictions, provided braking facilities are adequate, in accordance with another recommendation in this same report, will more than offset any possible disadvantage that we can foresee.

Recommendation—That Section 118 (a) of the Motor Vehicle Act be amended to fix speed of trucks equipped with pneumatic tires as follows:

Trucks, including loads, weighing less than 18,000 pounds, 40 miles per hour; trucks, including loads, weighing 18,000 pounds, and not exceeding 22,000 pounds, 30 miles per hour; trucks, including loads, weighing over 22,000 pounds, 25 miles per hour.

BRAKING STANDARD

A serious defect in our present Motor Vehicle Act is the lack of standards for braking. The present law that the brakes shall be adequate to promptly check the speed of and stop such vehicles does not mean much from an enforcement standpoint. As the permitted speed becomes greater, it is correspondingly necessary that there be a standard of braking, to which all vehicles should conform. This is not a difficult standard to set up and would be of vast assistance to the enforcement officers. Further elaboration of this point is considered unnecessary.

Recommendation—That every motor vehicle or combination of motor vehicle and trailer operating upon the public highways shall be equipped with brakes adequate to bring such motor vehicle or combination of motor vehicle and trailer to a complete stop when tested upon dry asphalt or concrete pavement surface where the grade does not exceed one per cent, and when operating at speeds set down in the following table, in the distance set opposite such speeds, provided that no vehicle shall be tested for brake efficiency at a speed higher than that permitted by law for such vehicle, and further provided that no vehicle be tested for brake efficiency at a speed higher than 30 miles per hour.

Miles per hour	Stopping distance
10	9.3 feet
15	20.8 feet
20	37.0 feet
25	58.0 feet
30	83.3 feet

And provided, further, that any truck, when loaded to capacity, shall have not less than 70 per cent of the gross load under brake control; and any trailer with gross load in excess of 6,000 pounds, when loaded to capacity, shall have not less than 50 per cent of the gross load under brake control.

The above section, however, shall not apply to implements of husbandry, special mobile equipment, or equipment under special permit.

TIRES

The operation of solid tire equipment after its useful life has past is one of the most common abuses on both highway and vehicle. The present Motor Vehicle Act does not adequately cover the situation, but is framed for perfect rubber conditions.

It is the custom of many operators to wear solid tires down to the point where resiliency has passed from the rubber, and this condition often exists even though there is a compliance with the present law as to thickness. Uneven tire surface caused by gouges

and cuts increase the impact and destructive effect of solid tires.

Recommendation—That vehicles equipped with tires of any material other than metal, the weight resting upon the surface of the highway should not exceed 600 pounds upon any inch of the channel base width of tire.

That horse-drawn vehicles equipped with tires of metal, the weight resting upon the surface of the highway should not exceed 500 pounds upon any inch of the width of the tire.

That the minimum thickness of rubber for solid rubber tires should be as follows:

Width of tires, 3 inches to 5 inches, inclusive—1 inch.

Width of tires, 6 inches to eight inches, inclusive—1½ inches.

Width of tires, 10 inches and over—1½ inches.

That the variation in the width of the entire traction surface of solid rubber tires due to injury or wear should not exceed 15 per cent.

That the variation in the thickness of the rubber of solid tires on any part of the entire traction surface, due to injury or uneven wear, should not exceed 15 per cent.

That solid rubber tires should not be permitted to be used on public highways when any portion of the rubber is not securely attached to the channel base.

That dual solid rubber tires should not be permitted to be used on public highways if there is average difference greater than one-eighth inch between the outside diameters of each of the single tires composing the dual tire.

CONCLUSION

Your committee, assembled from various portions of the state, has considered this matter with a sincere desire to be helpful. We believe that in the past insufficient weight has been given the opinions of those competent to know, through training and observation, as to the effect on highways.

It was our decision early in our consideration that it should not be required of your committee to frame in detail the exact wording of recommended legislation, believing that this task can better be performed by a legal committee appointed by your association, with whom we would be glad to cooperate.

Our report represents our own opinions, and not the opinion of any private interest, association or group. We trust that if you can not subscribe to all of our recommendations, at least part of them will prove helpful to you, and if so, we will feel gratified that we have contributed even to a minor extent in effecting a definite adjustment between two seemingly conflicting interests—that is, the public on one hand and the commercial highway user on the other.

In the United States there is a mile of road for every forty persons. Brazil has only a mile to 944 persons. Conversely, every person in the United States has 44 yards of road to walk or ride upon, while the Brazilian must be satisfied with less than 2 yards. We have a mile of road in every square mile and a quarter of area, and Brazil has only a mile in each 10 square miles. Chile has one mile of road to every 150 persons, or each Chilean has the use of 12 yards of road. Chile has a mile of road in each 12 miles of area. Last year Chile spent approximately 48 cents per capita on roads, Peru spent less than 25 cents, Uruguay \$1.09, and Salvador 30 cents, while the United States spent almost \$11 per capita.

Complete Text of Feather Road Routing Report

[EDITOR'S NOTE: A large number of requests have been received for the complete text of the recommendation of B. B. Meek, Director of the State Department of Public Works, in the matter of the location of the Feather River lateral of the state highway system. Below will be found Mr. Meek's report and recommendation to the California Highway Commission together with the formal vote of that body.]

February 15, 1928.

To the California Highway Commission.

GENTLEMEN: Consistent with an allotment made by you for the purpose and at my request, an engineering study of possible routes connecting Quincy, the county seat of Plumas County, with the state highway system at Oroville was begun last August. This study very early developed the fact that a road via the Middle Fork, Feather River Canyon, would be shorter from Oroville to Quincy and from Oroville to the Nevada state line than a road via the North Fork Canyon.

I quote from this first engineer's report:

It has been assumed for purposes of this report that any available route within the Feather River drainage will qualify (legally). * * *

The climate and topography of the country lying between Oroville and Quincy have had a distinct bearing on the matter of the routing of this highway. Always supporting the demand for a river highway in preference to a route over the ridge has been the contention that the river route would be a part of an all-year open road over the Sierras.

Such a possibility actually exists because of the wide separation between the geographic and climatic summits in this region. The geographic summit is at Beckwith Pass at the headwaters of the Middle Fork or at Fredonia Pass at the headwaters of the North Fork. The climatic summit lies along a high western range extending from Red Mountain in the Yuba River territory northwesterly to Mt. Lassen. This range causes heavy precipitation far to the west of the geographic summit with the result of light rain or snowfall in the Sierra Valley or at Beckwith Pass. This heavy precipitation falls as snow on the higher parts of the range to a depth at times as great as 20 feet and effectually blocks the roads over the ridge for from five to seven months of the year.

The North Fork cuts through this ridge at a low elevation and heads near Fredonia Pass. This pass is on the Red Bluff-Susanville lateral and is 5700 feet in elevation. The Middle Fork of the Feather River also cuts through this ridge at an elevation below heavy snowfall and heads near Beckwith Pass.

To reach Beckwith Pass by the North Fork Route the road must go over Lee's Summit on Spring Garden Ridge at elevation 4450 lying east of the climatic summit but still having frequent snowfall to the depth of 5 feet or more. No summits within the snow area are crossed via the North Fork to Quincy. Quincy, at elevation 3400, frequently has snowfall to a depth of 4 feet and has had as much as 6 feet.

No intermediate summits are crossed on a route following the Middle Fork leading to Beckwith Pass. To reach Quincy, however, it is necessary to cross the Thompson summit between Nelson Point and Quincy. This summit is the same elevation as Lee's Summit and being but a few miles closer to the climatic summit, has about the same snowfall.

The conclusions from a study of climatic conditions are that no road will be snow free to Quincy or to Beckwith Pass to such an extent that snow removal equipment will not have to be kept in readiness. A road over the ridge via Bucks does not appear practicable as an all-year road. Either of the river roads could be kept open practically every day of the year at a reasonable cost for snow removal. In so far as can be ascertained exceptions to this latter statement might occur with such heavy snowfall as is reported for 1889-90 and 1907.

The profile, page 5 of maps, shows comparative data for the major routes over the Sierras compared with the Feather River Route.

These routes, naming them from south to north, are the Placerville route over Echo Summit, the Victory Highway over Donner Summit and the Yuba Pass Route over Yuba Pass and Beckwith Pass. These routes all have an advantage in distance over the Feather River Route. This advantage, as far as winter travel is concerned, is offset by the high summits to be crossed and the depth of snow.

For purposes of considering the possibility of keeping any of these roads open over the high summits the area covered by snowfall may be divided into two classes: First, that where prompt work with a push plow during or after a storm will clear the roadway with possibly a light rotary to follow and clear the accumulated snow from the shoulders to give the push plow a chance at the next storm. This may be classed as light snow removal where maximum depth rarely exceeds six feet and presents no particular problem in the matter of keeping the road open or any particular hazard to traffic. The other class involves removal where snowfall is much heavier and the depth of packed snow may reach 20 feet or more. This may be classed as heavy snow removal. Keeping roads in areas of the second class open to traffic may be very difficult and requires other equipment and methods than are now employed. Likewise a hazard is presented to traffic in the danger of getting trapped in storms or drifts that may block the road in a very short time.

The difficulties in keeping an open road over high summits depend somewhat on the mileage of light snow removal but more upon the mileage of heavy removal.

To maintain an open road over Echo Summit would involve some 45 miles of light snow removal about 17 miles of which would be in Nevada, and about 10 miles of heavy snow removal. Maintenance of an open road over Donner Summit would require about 30 miles of light snow removal and about 12 miles of heavy snow removal. A road over Yuba Pass would require about 30 miles of light snow removal and 10 of heavy. To keep the Feather River Route open to the state line would require light snow removal for about 75 miles. Only for about 25 miles except in abnormal years would the use of a rotary plow be necessary.

For at least 25 miles of this distance the graders or tractor graders used on regular maintenance would keep the road clear. * * *

To find a justification for the large expenditure that construction of a river route would require, we must find other uses (than local traffic) for this road. Nor need we look far to find them for an extension of this route across Beckwith Pass would encounter less snowfall than any other route. This is due to the fact that the forks of the Feather River cut through the area of heavy snowfall at comparatively low elevations.

There is an unmistakable and growing popular demand for the maintenance of an open all-year road over the Sierras. This demand whether it takes the form of periodical or continuous agitation for keeping open some particular road or pressure for construction of a route that may be kept open with much less difficulty may be taken as evidence of a necessity that means be provided for continuous access to the states lying east of California.

It is becoming more obvious that northern California for its more complete development requires an open road over the mountains. Heavy snow removal on the roads over high summits presents problems beyond satisfactory solution on existing roads or with equipment now available. The most practicable means of obtaining such a road would appear to be the construction of a route that would cross the mountains at a lower elevation and encounter less snowfall.

Admitting that northern California is unquestionably entitled to one all-year road across the Sierras the opportunity to so lay out this Oroville-Quincy lateral, or Feather River Route, that it will become an integral part of such a road, furnishes sufficient reason for expending whatever sum a high standard road along the river will cost.

* * * * *

There is no traversable road following this route (North Fork). County roads by various routes other than the one described lead as far as Hog Wallow Gap, about 1.5 miles southerly from Jarboe. From Hog Wallow to a point opposite Storrie—the location of the power house being installed by the Feather River Power Company—a road has recently been built by the Great Western Power Company for a distance of 24 miles at a cost of approximately \$330,000. This road utilizes for about one-third of its length the old Utah Construction Company road which has been widened somewhat. The road was built by the Great Western Power Company first, in order to facilitate delivery of material for the construction of a transmission line from Storrie to the valley to carry the power from the Storrie plant, which power is contracted for by the Great Western Power Company. This road will also serve in the future as a means of

access for maintenance of this line and the Caribou line of the Great Western Power Company.

I am advised that the grades of this road are so laid out that improvement of alignment can be made without exceeding our maximum rate. In order to secure better access to the power lines it has undulations that would not be warranted in the location of a highway. While Butte and Plumas counties have contributed to the construction of this road and regard it as a completed portion of the North Fork highway it is doubtful if any portion of it could be followed by a state highway location. In the first place, adverse grade should be reduced as much as possible, and second, the location should be as far from the transmission lines as practicable. This road as built is for the major portion of its length very close to one or both transmission lines and portions of it are dangerously close to the Western Pacific Railroad. See photographs 259 and 263, page 61. The cost of widening and straightening this road to meet the minimum requirements for a state highway would be exorbitant in the matter of so handling excavation as not to injure the transmission lines and in the matter of interference with the towers in the improvement of the alignment. This subject is further discussed under the heading of "Alternates."

Between Storrie and Camp Rodgers several short pieces of the old Utah Construction Company road are found but these are of very limited value even as pioneer roads to aid construction.

Under the direction of Supervisor Wm. Lawrence of Plumas County, a road is being graded from Indian Falls, a resort on the Greenville-Quincy road about 13 miles north of Quincy, down Indian Creek and the East Branch toward Twain. This is a fair county road for very limited traffic and is being built as a part of the North Fork Highway. It will serve Indian Valley better than it will Quincy and above the junction of Indian and Spanish creeks—3 miles below Indian Falls—this road would not be a part of the road to Quincy. It will furnish a better outlet to the territory adjacent to Twain which is now reached by a narrow and steep road connecting with the main road about 5 miles north of Quincy.

Between the present end of this road and the dead end of the Great Western Power Company road at Storrie are 29 miles of road to be built to afford a usable connection. Reports regarding this road placing the length to be built to complete the route as 17 miles are incorrect.

CONCLUSION

The data herein set forth indicate that an interstate route using the major portion of the Middle Fork Route has these advantages:

It is 24.6 miles shorter than any other suitable route.

It will be more easily kept open throughout the year than a route via the North Fork over Lee's Summit.

It will cost less than the North Fork Route.

As a road to Quincy the Middle Fork Route will be 7.7 miles shorter than the North Fork Route and will cost \$1,295,727 less.

Considered independently as an interstate route, the Middle Fork will cost \$1,131,975 less than the North Fork Route.

The additional cost of keeping the Middle Fork Route open to Quincy is insignificant.

These disclosures suggested the need of ascertaining the legal status of the Middle Fork Route. I conferred with Attorney General Webb and the Department of Public Works attorney, C. C. Carleton, and subsequently requested a legal opinion from each of these gentlemen. I quote from attorney Carleton's opinion:

January 30, 1928.

Mr. Bert B. Meek,
Director of Public Works,
Sacramento, California.

DEAR SIR: Subject: *Legal problems relating to the location of the state highway between Oroville and Quincy.*

FOREWORD

A massive volume of absorbing interest could be compiled containing the general history of the presentation, promotion and consideration of various routes for a state highway from Oroville to Quincy, as set forth in various engineering, economic and military reports; petitions and resolutions of public and civic bodies; and the official acts and orders of the California Highway Commission from the organization of the Commission, in the year 1911, to the present time.

The files and minutes of the Commission reveal a wealth of information concerning the engineering advantages and disadvantages of the rival routes, their respective scenic attractions and historical associations, and their adaptability, or lack thereof, as logical links in all-year military and interstate highway systems.

But despite the accumulation of this fund of engineering and economic information during the past sixteen years, one of the most important angles of the situation, namely, the legal, has remained unsettled and untested.

To the present time the legal questions involved in the location of this much discussed portion of the state highway system have been moot ones, and, within the past thirty days, for the first time the Attorney General of the State of California has been requested to render a formal opinion as to the legal aspects of the matter; such request being made by you.

It is the purpose of this report to review the legal history of the proposed project, to state some of the legal points arising therefrom, and to indulge in some speculations as to the probable conclusions of the courts should their intervention be sought.

ROUTES FOR A STATE HIGHWAY FROM OROVILLE TO QUINCY UNDER CONSIDERATION

1. North Fork Route.

Which follows the North Fork of the Feather River to its junction with the East Branch at Howells; thence along the East Branch to the junction of Indian Creek and Spanish Creek at Paxton; thence following Spanish Creek to Keddle; thence to Quincy.

2. Ridge Route.

Which follows in a general way the route of the present traveled road from Oroville to Quincy via Buck's Ranch, lying between the North Fork and Middle Fork routes.

3. Middle Fork Route.

Which follows the Middle Fork of the Feather River via Nelson Point to Quincy.

Comparative costs and distances of the routes.

The North Fork Route will be 81 miles in length between Oroville and Quincy, whereas the Middle Fork will be but 73.3 miles in length.

Hence the Middle Fork Route, as between these two cities, will be 7.7 miles shorter than the North Fork Route.

As a link in an interstate connection, the Middle Fork Route will be 24.6 miles shorter than any other all-year route in that vicinity.

As a road to Quincy, the California Highway Commission's engineers estimate that the Middle Fork Route will cost \$1,295,727 less than the North Fork Route; that, considered independently as an interstate route, the Middle Fork will cost \$1,131,975 less than the North Fork Route to the Nevada state line.

The engineers estimate that the gross cost of the North Fork Route will be \$7,655,607; that of the Middle Fork Route will be \$6,359,880.

It is conceded that the Ridge Route would be shorter and less expensive than the other two routes, the mileage being 66 miles between Oroville and Quincy and the probable cost about \$3,000,000, but the Ridge Route would not provide an all-year road as would the other routes, for the reason that it is blocked by snow for a portion of the year.

The foregoing data are presented as pertinent to questions of directness and practicability to which reference is hereafter made.

The first two state highway bond issues.

In 1910 California passed its first state highways act providing for a bond issue of \$18,000,000.

In 1916 the second state highways act was passed providing for a bond issue of \$15,000,000.

These two acts were referendum measures and provided for the construction of a system of state highways, including county-seat laterals.

Oroville and Quincy were not expressly named in these acts, and the mandate to the State Department of Engineering, the predecessor to the State Department of Public Works now acting through the California Highway Commission, was that it should locate the highways by the most "direct and practicable" routes.

By these acts a very liberal discretion was vested in the state highway officials, they being limited only by the words, "most direct and practicable routes."

It will probably not be seriously urged that if only these two acts were in force at the present time, that a court would annul the action of the California Highway Commission, if, in the exercise of such discretion, it should choose either of the three routes, or modifications thereof, for the final state highway location for a county-seat lateral between Oroville and Quincy.

The general rule of law would apply that the court would not interfere in such a case, unless *bad faith* was clearly shown.

As a matter of history, it may be safely stated that prior to 1919 the Commission, owing to a shortage of funds and considering the large estimate of probable cost of the North Fork Route (the Middle Fork Route not being a serious contender in that day for location honors), was strongly inclined toward the Ridge Route on account of its shorter mileage and lesser expense.

Had the Ridge Route been actually adopted at that time such location would have been legally unassailable.

Constitutional amendment of 1919.

At a special election held July 1, 1919, the people of the State of California adopted a constitutional amendment (section 2, article XVI) providing for the issuance of state highway bonds to the amount of \$40,000,000 to complete the projects contemplated by the two previous state highway bond issues in amounts \$18,000,000 and \$15,000,000 respectively (including *county-seat laterals*), and to construct thirty-one additional projects specified in the constitutional amendment.

One of the "additional" highways was designated "Feather River Route, Oroville to Quincy."

Feather River Route, Oroville to Quincy.

The "Feather River Route, Oroville to Quincy," is described as an "additional highway," "to be located by the most direct and practical route," in the \$40,000,000 highway bond constitutional amendment of 1919.

The significance of such designation has now become the subject of legal interpretation and research.

The North Fork Route was the one followed by a transcontinental railroad, whose nationally known slogan for years has been the "Feather River Route," and which, very naturally, resulted in the North Fork highway route also being called the "Feather River Route." The snow free, non-snowed features of this railroad gave impetus to the agitation for an all-year road via the North Fork Route. The press in 1919, and prior thereto, alluded to the North Fork Route as the "Feather River Route." Maps issued as campaign publicity (but not as official maps, accompanying the bond election) preliminary to the special election of July 1, 1919, set forth the North Fork Route, its mileage, and the estimate of cost thereof as made by the California Highway Commission's engineers.

But the most important contemporaneous piece of evidence is the following statement of the Engineering Department of the California Highway Commission issued in 1919 just prior to the special election, which is in words and figures following:

"FEATHER RIVER ROUTE, OROVILLE TO QUINCY, in Butte and Plumas counties, about 92 miles in length, to be graded in the mountainous portion, and paved in the valley if there is sufficient money.

Under the former bond issue a road from Oroville to Quincy was included and \$850,000 is now added to cover the additional cost of building the road on the Feather River Canyon Route *instead of via Buck's Ranch as heretofore contemplated.*

This road, following the canyon of the North Fork of Feather River, through the mountains, will, in connection with the present Beckwith Pass road, furnish a practically all-winter route across the central Sierra Nevada, as well as open up a beautiful region, abounding in fish and game, to the tourist.

Among California's most valuable assets must be counted her mountain playgrounds, and this road will open up to the motoring public a number of beautiful spots, now accessible only by railroad, if at all.

From Quincy, the easterly terminus of the proposed road, some of the most attractive spots in the entire Sierras are within easy reach."

This was an explanation prepared by the department for use in the campaign.

Concluding this portion of the report, it can be stated without fear of successful contradiction, that the real reason why the North Fork Route has not been built has been because of shortage of funds to "tackle the job." To the present time such construction has been financially forbidden.

As a matter of record, the California Highway Commission adopted the North Fork Route on the 20th day of October, 1921, but on January 4, 1923, this action was rescinded by the following action:

"It appearing that the surveys of the proposed highway up the North Fork of the Feather River connecting Oroville and Quincy have shown that the cost of such a road built to standard width would approximate \$7,000,000 with \$1,300,000 in the bond issue for its construction; that the conditions as imposed by the United States Bureau of Public Roads as a prerequisite to the use of federal funds on this road would unduly obligate and commit California's share of these funds for many years to come to the disadvantage of the state; that the construction of the highway up the North Fork of the Feather River involves complications difficult of solution with the Western Pacific Railroad and the Great Western Power Company which have certain established rights in the canyon secured by prior occupancy, with the possibility of damage actions involving large sums; that the maintenance of the proposed highway up the North Fork would be excessively heavy; it therefore appearing that the surveys along the North Fork of the Feather River have shown that the route does not conform to the mandate of the bond issue for construction along 'the most direct and practical route.'

VOTED, that the vote of the California Highway Commission of October 20, 1921, adopting said route is hereby rescinded, and that the State Highway Engineer be instructed to immediately discontinue all surveys and plans thereon."

No official action has been taken by the California Highway Commission regarding such location subsequent to January 4, 1923, as far as the writer can ascertain.

CONCLUSIONS

First: In the opinion of the writer of this report, the selection of the "North Fork Route" could not be successfully attacked in the courts.

Second: That when the phrase "Feather River Route" was employed, that it was positively "intended" to apply to the so-called "North Fork Route."

Third: That the California Highway Commission can not ignore section 2, article XVI, of the constitution \$40,000,000 bond amendment of 1919 and justify a location on the Middle Fork or any route other than the "North Fork Route" by reason of any authority previously granted by the first two state highway bond acts.

Fourth: That the fact that some other route may be built one million or several million dollars cheaper than the "North Fork Route" or that such routes may be shorter or more suitable links in an interstate highway system, can not be taken into consideration by the California Highway Commission, however feasible or economical they may be, for the reason that the intentional mandate of the law is to build a road from Oroville to Quincy along the "North Fork Route" (by the most direct and practical route adjacent thereto), and the law makes no allusion to any state highway project beyond Quincy or any prospective tie-up with the highway systems of other states.

Fifth: That should the California Highway Commission differ from the foregoing conclusions of the writer, and determine to adopt a route other than the North Fork Route, then the only suggestion that can still be ventured is that no appreciable sum of money be spent on such alternative route until the legality and constitutionality of such location be first sustained by the Supreme Court, after initiation of suitable proceedings for the judicial test thereof.

It would be most presumptuous for the writer to urge that the Supreme Court could not, in its own wisdom, conclude that the legislation did vest in the highway location officials a *paramount and exclusive* discretion in the matter; that the words "Feather River Route" are merely directory and of general application; or that the evidence presented on behalf of the North Fork was not worthy of judicial credence or entitled to be admitted into a judicial record.

In closing this report, permit me to state, for you have invited my frank conclusions herein, that I am firmly convinced that if the case in favor of the "North Fork Route" is fully and forcibly presented, that the court of last resort will determine it to be the route, and the *only* route contemplated by the constitution of the State of California, and that such an interpretation is justified by the historical facts surrounding its selection by the legislature and the people.

Respectfully submitted.

C. C. CARLETON.

Chief, Division of Contracts and Rights of Way, Department of Public Works.

I quote from Attorney General Webb's opinion:

San Francisco, February 15, 1928.

Hon. B. B. Meek,
Director, Department of Public Works,
Sacramento, California.

DEAR SIR: Under the date of the 17th ult. you submitted for an expression of the views of this office three questions, and indicated your desire to have an opinion thereon prior to the meeting of the Highway Commission to be held on the 16th and 17th of February. The three questions so submitted by you are:

"1. Is this department limited by law in the location to the so-called North Fork Route?

2. Assuming that the so-called Middle Fork Route is shorter and less expensive, is this department vested with the discretion to determine that the Middle Fork location comes within the purview of the state highway legislation, as being 'the most direct and practical route,' and as being covered by the phrase, 'Feather River Route; Oroville to Quincy,' used in a general sense?

3. Assuming that the phrase, 'Feather River Route; Oroville to Quincy,' was intended by section 2, article XVI of the constitution of California (\$40,000,000 bond issue) to mean the North Fork, is this department legally justified, nevertheless, in locating a state highway on the Middle Fork on the theory that this department was given such authority by the first two state highways acts (1909—\$15,000,000 bond issue, and 1915—\$15,000,000 bond issue), before the adoption of section 2, article XVI of the constitution, and that such section 2 expressly described the 'Feather River; Oroville to Quincy' as an additional state highway?"

Following such presentation of your questions you add:

"While the above questions occur to us, yet we desire you to furnish to this department a comprehensive opinion on the subject matter, touching on such other points as may appear to you to be pertinent to this inquiry."

As the answer to these questions in a measure depends upon some facts of history, geography and common knowledge, it seems appropriate that a reference to such facts be first made. * * *

Answering question 1, it is my view that your department is limited by law in the location of the Quincy lateral to the so-called "North Fork Route."

2. My view is that neither the assumption that the "Middle Fork Route is shorter and less expensive," nor the existence or assumption of any other fact would empower or authorize the highway authorities to determine that the Middle Fork location comes within the purview of the state highway legislation.

3. It is my opinion that the authority given to the highway department by the acts of 1909 and 1915 to select the Middle Fork of the Feather River as the route of the Quincy lateral was withdrawn by the act of 1919, and that therefore such authority does not now exist. I am of the further view that the "Feather River Route; Oroville to Quincy," is not "an additional state highway," but is the only highway to Quincy, the construction of which is now authorized by law.

Very truly yours,

U. S. WEBB,
Attorney General.

During the time that the attorneys' reports were in course of preparation, we pursued the engineering study. In fact, this study has continued down to the present moment.

I have believed that before committing the state to an expenditure involving several million dollars, certainly an exhaustive study, both engineering and legal, ought to be made. This has now been done.

I quote from the second engineer's report:

Like all modern highways in rural California, the proposed highway through the Feather River country will carry, and must be designed to best accommodate, two general types of traffic, namely, recreational or tourist travel, and business or commercial intercourse. An appraisal of the needs of each of these types, as applied to this particular road, is necessary in forming a rational conclusion as to its proper location and design.

The factors which enter into the make-up of the best recreational road are strongly contrasted in some respects to those which go to make up the best road for business or commercial purposes. In the latter

type, for economic reasons, the road must be as short as possible, and free from all obstacles which will retard speed of operation, and at the same time, be safe for the traffic it carries. Modern construction standards will eliminate most of the obstacles to this speed of operation, and will make the road safe, but the routing and location must be depended upon to obtain the shortest distance and to minimize the greatest obstacle to year-around traffic on this particular route, snow. For its use as a business or commercial thoroughfare, therefore, we must look for the route which will serve the present and potential traffic best by reason of the shortest possible distance, and its freedom from snow in the winter season.

Contrasted to the two essentials of a commercial road mentioned above, are the needs of a recreational road. Distance, while important, should be sacrificed, in a rational degree, to make accessible to the tourist his prime objectives, proximity to forest and stream, mountain scenery and the natural beauties, and opportunity for sport and recreation. The other prime requisite for the commercial road, freedom from snow, is of little or no importance on the recreational roads, since such roads are not used during the winter season.

Combining the values both for recreational and commercial traffic of both feasible routes as discussed above, taking into account the population, resources, etc., given in the statistics, and their distribution as shown on the map, it will appear that for the area within the state, the advantages of the North Fork Route outweigh those of the Middle Fork Route by many times, probably more than five to one. This is true, considering future possibilities for the development of this portion of the state as well as present conditions. * * *

Summarizing the above discussion of all traffic from the neighboring states, it appears that the North Fork routing will serve commercial traffic about equally as well as the Middle Fork, and that it will serve all recreational traffic far better. * * *

That portion of this transcontinental traffic which would be influenced by the routing of the Feather River highway, will be benefited most greatly by the route which makes most easily accessible the greatest recreational or touring possibilities. Distance is not an essential, since, if it were, no such traffic would traverse either highway in the Feather River country, but it would all take the shorter route via Donner Lake. * * *

The traffic of the area within the state will be more greatly benefited by the construction of the North Fork Route, as compared to the Middle Fork Route, in the proportion of five to one or more.

Traffic with the neighboring states will be somewhat more greatly benefited by the construction of the North Fork Route than the Middle Fork Route.

Traffic with far distant states will be more greatly benefited by the construction of the North Fork Route, as compared with the Middle Fork Route, in the proportion of about three to one.

Considering the character and volume of traffic the road will handle, and the area of the state to be served and developed, it would appear that the advantages of the North Fork Route, as set forth above, justify its probable greater cost, as compared with the Middle Fork Route.

(Note: Read Temporary State Highway Engineer Morton's report.)

Both by General Webb's and attorney Carleton's reports, you will note that in their opinion a road constructed up the Middle Fork Canyon will not satisfy the law to connect Quincy and Oroville via the Feather River Route, while both attorneys agree that a road built up the North Fork Canyon will satisfy the law.

The Middle Fork Route being precluded from further consideration by the law, is the state justified at this time in beginning the construction of a road up the North Fork Canyon, the cost of which will run into several million dollars before it is completed, or ought we take the view that the cost is too great and thus prolong indefinitely the settlement of this eighteen-year-old controversy, passing a determination of the matter on to subsequent administrations?

You will note that one of the engineers' reports indicates that the Middle Fork will serve Nevada and the East better than the North Fork, but that the North Fork will serve Oregon, Idaho and the northwest country better than the Middle Fork, and that there is less snow between Oroville and Quincy via the North Fork but more snow between Quincy and

the Nevada state line on this route. However, the recreational traffic will be greater out of all proportion than the interstate traffic, and this report indicates a very decided advantage in favor of the North Fork Route for recreational traffic.

I have just returned from a trip with the engineers through the North Fork Canyon and there are no unusual physical obstacles to the construction of a road in this canyon.

Considering the fact that a road up the North Fork Canyon will meet the constitutional requirement to connect Quincy with the state's highway system; that such a road will also serve as a link to an all-year trans-Sierra interstate highway; that it will open up by a direct all-year route vast new scenic and recreational areas; that this is the only county-seat lateral in the state on which not a single dollar has been expended on construction; and that we can now finance one or more convict camps for this project, I recommend that location surveys be immediately started in the North Fork Canyon and construction proceed thereafter as fast as engineering data are complete and funds are available.

Attached hereto please find both engineers' reports and Temporary State Highway Engineer Morton's letter of transmittal. Also please find attached the complete opinions of Attorney General Webb and the Department of Public Works attorney, C. C. Carleton.

All this for your consideration and appropriate action.

Very truly yours,

B. B. MEEK,
Director.

VOTE OF COMMISSION

Upon the conclusion of Mr. Meek's report and recommendation Commissioner Baumgartner made the following motion, which was seconded by Commissioner Harris and adopted by unanimous vote.

That the report and recommendation of the Director of the Department of Public Works on the Oroville-to-Quincy Lateral, State Highway, is hereby accepted and approved;

That the North Fork of the Feather River be and hereby is adopted and designated as the route for the Oroville-to-Quincy Lateral, State Highway;

That the work of construction shall be prosecuted with all due diligence and as rapidly as financially and engineeringly possible.

The beginning of the year 1928 saw increases in the gas tax from 3 to 4 cents taking effect in two states, Arizona and New Hampshire. The Arizona legislation was passed in August. In New Hampshire the rate was increased from 2 to 3 cents early in 1927 and the special session in November boosted the rate another cent.

This makes twelve states which have a 4-cent gas tax, while six states have a higher tax, one having a 4½-cent rate and five having a 5-cent tax.

Fourteen states have the 3-cent tax and one state has 3½. This makes a total of thirty-three states which have a gas tax of 3 cents or more.

Thirteen states have a 2-cent tax. Only two states, New York and Massachusetts, have no gas tax.

Statistics show that more persons have been killed in automobile accidents during the last ten years than were killed in the American forces during the World War. Motor vehicle accidents accounted for 160,390 deaths in the United States between January 1, 1917, and December 31, 1926. The total number of American soldiers, sailors and marines who lost their lives during the World War was 130,326.

Chief Accountant

For Works Department

THE task of bookkeeping books on an annual expenditure of \$30,000,000 is the assignment given E. R. Higgins, recently appointed chief accountant of the Department of Public Works. Before coming to the Department of Public Works Mr.

Higgins was an accountant in the State Department of Finance from 1923 to 1928. He is a graduate of the University of California with the class of 1919.

Mr. Higgins has supervision over the accounting of all of the divisions of the Department of Public Works' expenditures which total approximately \$30,000,000 a year. These expenditures are made under the budget system and



E. R. HIGGINS.

the foundation of the accounting system is this budgetary plan.

PROGRESS REPORTS FROM THE FIELD

ALPINE COUNTY—All roads closed during winter and spring months on account of snow.

AMADOR COUNTY—The grading contract on the Alpine Highway between Jackson and Pine Grove is progressing very satisfactorily. Mr. G. D. Contoules is the contractor.

Work is to start soon on another stretch of the Cosumnes River to Plymouth section of the Mother Lode Highway. \$5,000 has been allotted for this work.

CALAVERAS COUNTY—At the request of the city authorities and at their expense, this district made survey and prepared plans and specifications for paving with asphalt macadam state highway routes through the city of Angels, for which a bond issue was voted by the citizens. On the twentieth of February, seven bids were received and contract was awarded on February 29, 1928, to the Adams Company of Angels Camp.

Improving alignment and widening of Mokelumne River Grade leading to Mokelumne Hill is now under way.

FRESNO COUNTY—Work, consisting of extending and rebuilding all of the old narrow culverts and bridges on Route 4, in Fresno County, is proceeding rapidly.

A construction crew is working on Route 10—"Sierra-to-the-Sea" lateral, widening the roadway, changing line to avoid the creek and building bridges from Coalinga west to the county line. This work is attracting considerable favorable comment from the residents of the district and tourists.

IMPERIAL COUNTY—Two new reconstruction contracts have been awarded in Imperial County. Under one contract, that portion of the El Centro to San Diego highway extending from El Centro to Seeley

will be drained and the pavement will be widened to 20 feet and redecked with asphaltic concrete. Under the second contract a storm water protection system will be constructed along the Los Angeles, Imperial Valley Highway, west of the Salton Sea. This improvement will extend from the Trifolium Canal to the Arroyo Salado wash and covers a large portion of the highway which has been repeatedly damaged by floods.

The 2.3-mile grading project on the Mountain Springs grade between El Centro and San Diego replacing the road destroyed by floods in December, 1916, is now completed.

KERN COUNTY—The recent acceptance of two contracts, one completed by the Valley Paving Company and one by Force-Currihan & McLeod, between Delano and Lerdo, completes the widening to 20 feet of all but 2 miles of the pavement on Route 4 in Kern County.

The mechanical rakes and finishers were used on both jobs and the results secured were very satisfactory.

Wide flat slopes were utilized and all grading was well finished, resulting in a roadway which is pleasing to view as well as to ride on.

A power shovel outfit is working in the Kern River Canyon from Democrat Springs easterly, widening and straightening the road, which was taken over from the county last year.

This work will assist in making one of Kern County's most popular recreational roads more safe for the expected summer traffic.

A survey of the road from Wasco to Famosa on the Cholame lateral has just been completed, preparatory to getting under way some needed improvements on this highway.

KINGS COUNTY—Spring grading work is completed along Route 10 in Kings County and it is hoped to minimize the fire hazard through this important farming country this summer.

LASSEN COUNTY—All work except routine maintenance has been at a standstill in Lassen County for the past two months, due to weather conditions.

The new rotary snow plow which we have stationed between Susanville and Westwood has been doing excellent work, and so far this winter we have had no trouble in keeping the road open for traffic, although the snowfall has been comparatively light.

Plans and estimates are now in progress for the construction of the 12 miles from Bieber to the Modoc County line.

MADERA COUNTY—Six and one-half miles of road in Madera County is being advertised for reconstruction, south of Madera. The improvement will consist of widening and resurfacing with asphaltic concrete.

A survey of the highway between Madera and Califa is now under way, preparatory to contracting some necessary reconstruction and widening of this road.

MARIN COUNTY—The Redwood Highway from San Francisco and east bay cities to the Russian River country and the redwoods of Mendocino and Humboldt counties, is attracting much constructive notice.

To meet traffic needs it has become necessary to do much widening and reconstruction work and plans and specifications are being prepared to improve that portion from San Rafael 7 miles northerly to Ignacio and the Black Point road junction.

In the meantime the contract which was let to the Pacific States Construction Company, to surface 0.76 mile through Kentfield with asphaltic concrete 20 feet wide and 2 inches minimum thickness with 2-foot rock shoulders, has just been completed.

MARIPOSA COUNTY—Work by the convict crew on the Yosemite All-year Highway north of Mariposa is progressing satisfactorily. Several line and grade changes have been made which materially widen and straighten this road.

Installation of 6600 lineal feet of standard laminated guard rail has just been completed by Contractor Burnett and the improvement has already proven of value in avoiding serious wrecks.

MENDOCINO COUNTY—The highway just north of the Mendocino County line, connecting the Redwood Highway with the coast via Booneville, known as the "McDonald to the Coast Road," is due for much localized improvement. It is mostly unimproved road and as a start the department has been authorized to widen and straighten the existing road. A number of wooden bridges and culverts are being rebuilt to take care of the drainage pending reconstruction of the road on improved and resurveyed alignment and grades.

MERCED COUNTY—Contractor H. C. Whitty has a crew of men extending culverts and bridges along Route 4 from Merced south to the county line. All of the old 20-foot structures are being extended to care for present and future traffic needs.

Larsen Bros. have completed their contract for 9 miles of gravel shoulders and widening of the embankment on Route 32 from Los Banos easterly to the county line.

MODOC COUNTY—The widening work being done by state forces, between Adin Summit and Canby, is about 70 per cent complete, and has already effected an enormous improvement on this section.

NAPA COUNTY—That section of new highway between Calistoga and Middletown, lying in Lake County, has been widened and several timber bridges built by district maintenance forces.

PLUMAS COUNTY—There has been no actual construction work during the past two months in Plumas County, on account of snow.

A condemnation suit has been filed to clear up the right of way situation across the Lake Almanor causeway, and when the necessary court order is received, the approach to the westerly end will be completed, and this unit thrown open to traffic. This work can be completed in about one week's time after we get access to the ground.

Plans and estimates have been completed for the westerly 6 miles adjoining the Tehama County line, the construction of which is proposed for this year.

RIVERSIDE COUNTY—A survey has been completed on the Mecca-Blythe road and plans are being prepared in the district office to advertise bids for letting a contract. The new improvement will be an extension of the 9-mile oiled gravel section west of Blythe. It will be financed from the additional gasoline tax fund for new construction.

SAN BERNARDINO COUNTY—*Foothill Boulevard*—Contractor Steele Finley has been laying pavement on the Foothill boulevard project since January 27th. Reports from the engineers in the field show substantial daily progress. The present contract extends from San Bernardino westerly through Rialto and Fontana to Cherry avenue, a distance of 9.3 miles. The new pavement is of asphaltic concrete 30 feet wide. The contractor is using mechanical equipment for spreading the material on the road surface. This is a late development in asphaltic concrete paving methods and is being observed with interest by other contractors and engineers.

Redlands to the Riverside County Line—A second pavement reconstruction project in San Bernardino County is under way on the Los Angeles-Imperial Valley Highway between Redlands and the Riverside county line. This contract is rapidly nearing completion. The new pavement will be 20 feet wide with improved shoulders 2½ feet wide along each edge.

Crest Route—Contractor J. G. Donovan has four paver shovels in operation on the U. S. Bureau of Public Roads project covering 3.54 miles from the "Pass" to the "Incline" on the new "high gear" road to the summit of the San Bernardino mountains. This project is a part of the heavy construction along the face of the mountain in the ascent from the "Pass" between Waterman and Devils Canyon to Squirrel Inn. By completing this project, the Bureau will have contributed a considerable share in the construction of this highway.

Grading is under way by state forces along the Rim of the World Drive between Running Springs Park and Squirrel Inn. This work is advancing westerly from the Running Springs end to a point west of the Allison Ranch. This new work on the Crest of the range is clearly visible from the whole San Bernardino Valley as a white line along the mountain top.

TEHAMA COUNTY—The surfacing of the 12-mile stretch of the Susanville road east of Red Bluff is nearing completion, and with a normal amount of rain, we will have a well compacted gravel road over this section for summer traffic.

The work of widening and building up shoulders between the Glenn County line and Corning has just been completed by state forces.

TRINITY COUNTY—The bridge across the Trinity River at Cedar Flat was completed last week, and we are now constructing the approach fills with state forces. The bridge should be open to traffic by March 15th.

TUOLUMNE COUNTY—Plans are in progress for resurfacing a portion of the state highway from Key-stone to Jamestown. Preliminary plans and right of way negotiations are under way for proposed construction east of Sonora.

The Big Oak Flat road is being placed in excellent shape preparatory to summer travel. Mountain Pass to Tuolumne River has been placed in shape for oiling early in the spring and Priest's Grade is now being resurfaced. Soldier's Gulch on the Mother Lode Highway has been widened and surfaced and is now in excellent condition. Before the state took over the

Mother Lode Highway, Soldier's Gulch was extremely narrow and dangerous and is now vastly improved.

SHASTA COUNTY—The section of the Pacific Highway now under construction between La Moine and Shotgun Creek is nearing completion, and the work should be completed early in May. The grading is about 95 per cent complete at this time, and the gravel surfacing is rapidly following.

The widening work between Redding and Cottonwood has been discontinued the past six weeks on account of wet weather.

The widening of a few dangerous places by state forces, at Manzanita Hill, about 30 miles east of Redding, has been completed, and this work, although not very extensive, has effected a much appreciated improvement to the road.

The convict camp 25 miles west of Redding has been on the job four months, and has made excellent progress.

The widening of the narrow cuts between Redding and Tower House has just been completed by state forces.

SISKIYOU COUNTY—Outside of routine maintenance, there has been very little new work in Siskiyou County the past two months.

There are several points on the Pacific Highway in Siskiyou County which, during the winter season, become icy and dangerous for traffic. We have made a practice of sanding these spots when necessary, and have recently completed shelters at numerous points along the road, for storing sand, thus making a dry supply available at all times.

SACRAMENTO COUNTY—The Arno cut-off contract, a grading and gravel surface job between Sacramento and Galt, has been tied up by high water. Mankel & Staring are the contractors on this piece of construction.

SAN BENITO COUNTY—The approaches to the newly constructed bridge over Pacheco Creek are being graded and surfaced with rock by a district maintenance crew.

SAN FRANCISCO COUNTY—The portion of the Bay Shore Highway lying within the county is to be improved in the near future by the city of San Francisco. A bond issue of \$9,000,000 recently voted by the city to build highways, includes this section and the plans and specifications are being prepared by the city for contracts to be let in the near future.

SAN JOAQUIN COUNTY—The new entrance northeast of Stockton, a grading and gravel surface job, is nearly complete. The contractors, Irey & Holden, however, have been prevented from proceeding with the work due to wet weather.

Bids will be opened March 28th for placing cement concrete pavement between Mossdale and French Camp.

SOLANO COUNTY—Preliminary plans and right of way negotiations are complete for proposed line change north of Cordelia.

STANISLAUS COUNTY—Bids were opened in the district office on February 9, 1928, for paving a line change in Ceres, Stanislaus County. The contract is for grading and placing an asphaltic concrete pavement. The Standard Paving Company of Modesto was low bidder, and the contract was awarded to them on February 16, 1928.

TULARE COUNTY—A survey crew under Resident Engineer Paul Wilcox is gathering data for a reconstruction in Tulare County, from the county line north through Earlimart.

YOLO COUNTY—Preliminary plans are complete for widening, shouldering, and second story paving about one mile east and west of the Causeway.

Teichert & Son, Sacramento, \$6,590. Contract awarded to Standard Paving Co. for \$6,305.

MONTEREY COUNTY—Timber bridge across Salmon Creek, Dist. V, Rt. 56, Sec. A. Engineer's Est. \$5,840. Bids opened Feb. 9th as follows: Theo. M. Maino, San Luis Obispo, \$3,988.22; C. D. Todd, Pacific Grove, \$4,840; W. J. Smith, San Luis Obispo, \$5,402. Contract awarded to Theo. M. Maino for \$3,988.22.

SUTTER COUNTY—Causeway across the Sutter By-pass on the Yuba City to Knights Landing highway, Dist. III. Engineer's Est. \$222,964.66. Bids opened Feb. 17th as follows: D. G. Jones, Stockton, \$252,711.88; Lord & Bishop, Napa, \$226,082.24; Ben G. Gerwick, Inc., San Francisco, \$267,015.74; Macdonald & Kahn, Inc., San Francisco, \$233,423.62; Holdener Construction Co., Sacramento, \$222,598.40; Peter F. Bender, No. Sacramento, \$230,209.44; A. W. Kitchen, San Francisco, \$247,641.42; C. E. Green & L. Worrel, Los Angeles, \$231,379.04; Chas. & F. N. Steffen, San Diego, \$224,439.06; C. W. Wood, Stockton, \$232,981.40; M. B. McGowan, San Francisco, \$263,890.60; J. F. Knapp, Stockton, \$214,759.80; Frederickson & Watson, Oakland, \$235,192.76; Jasper-Stacy Co., San Francisco, \$264,059.14; C. J. Nystedt, Stockton, \$229,820.22; The Duncan-Harrelson Co., San Francisco, \$244,646.18; Morrison-Knudson Co., Boise, Idaho, \$210,942.40; Healy-Tibbitts Const. Co., San Francisco, \$241,825.40. Contract awarded to Morrison-Knudson Co., Boise, Idaho, for \$210,942.40.

LOS ANGELES COUNTY—Constructing buildings, etc., at maintenance yard at La Crescenta, Dist. VII, Rt. 9, Sec. A. Engineer's Est. \$5,806. Bids opened Feb. 16th as follows: Jeff Clark, Gardena, \$5,390; A. O. Nelson, Pasadena, \$4,776; Joe Orosel, Los Angeles, \$6,678; Johnson Const. Co., Los Angeles, \$7,276; J. and B. Const. Co., Los Angeles, \$5,584.50. Contract awarded to A. O. Nelson for \$4,776.

EL DORADO COUNTY—0.49 miles to be graded between Shingle Springs and El Dorado, Dist. III, Rt. 11, Sec. B. Engineer's Est. \$10,131.50. Bids opened Feb. 20th as follows: L. C. Seidell, San Francisco, \$9,902; Nate Lovelace, Oakland, \$6,444; Mankel & Staring, Sacramento, \$10,038; G. E. Finnell, Sacramento, \$11,368; Mathews Const. Co., Sacramento, \$8,028; C. W. Wood, Stockton, \$8,814.50; J. R. Reeves, Sacramento, \$10,990.50; Tieslau Bros., Berkeley, \$10,077.50. Contract awarded to Nate Lovelace for \$6,444.

SAN DIEGO COUNTY—Two miles of grading from 3 miles southeast of Pine Valley to Buckman Springs, Dist. VII, Rt. 12, Sec. E. Engineer's Est. \$64,189.25. Bids opened Feb. 23d as follows: R. Johnson, Glendale, \$61,714.50; Jahn & Bressi, Los Angeles, \$46,948.75; Pioneer Transfer Co., Calexico, \$63,342; Kuhn-Lang Co., Los Angeles, \$49,336; Ernest Ward, Los Angeles, \$54,529; Charles E. Pitzer, El Centro, \$69,041.60. Contract awarded to Jahn & Bressi for \$46,948.75.

IMPERIAL COUNTY—Between Seeley and El Centro, 7.2 miles to be widened and surfaced with asphalt concrete, Dist. VIII, Rt. 12, Sec. C. Engineer's Est. \$188,235. Bids opened Feb. 29th as follows: J. C. Compton, Roseville, \$200,097.50; Jahn & Bressi Const. Co., Los Angeles, \$150,845.60; Carl Pleasant, Phoenix, Arizona, \$211,925.40; R. E. Hazard Const. Co., San Diego, \$175,220; Southwest Paving Co., Los Angeles, \$170,764; Pioneer Transfer Co., Calexico, \$162,675.60; Steele Finley, Santa Ana, \$175,734. Contract awarded to Jahn & Bressi Const. Co. of Los Angeles for \$150,845.

SONOMA COUNTY—Approaches to Sonoma Creek bridge, Dist. IV, Rt. 8, Sec. A-B. Engineer's Est. \$18,433.05. Bids opened Feb. 29th as follows: McDonald & Maggiora, Sausalito, \$22,376.20; Tieslau Bros., Berkeley, \$17,618.35; George Ellinwood Finnell, Sacramento, \$22,548.80; J. V. Galbraith, Petaluma, \$19,681.05; Stanley P. Cooley, Palo Alto, \$22,742.05; P. L. Burr, San Francisco, \$22,230.55; W. J. Taylor, Palo Alto, \$27,719.85. Contract awarded to Larsen Bros. of Los Banos. Contractor reserved right to omit oil treatment from surfacing. This was omitted making their price \$14,699.55.

SACRAMENTO COUNTY—Undergrade crossing (Southern Pacific tracks) at Brighton, Dist. III, Rt. 11, Sec. B. Engineer's Est. \$84,541.70. Bids opened March 7th as follows: Parker Schram Co., Portland, Oregon, \$76,986.50; E. B. Skeels, Roseville, \$81,623.05; W. A. Bechtel Co., San Francisco, \$76,672; Mathews Construction Co., Sacramento, \$76,258.25; C. W. Wood, Stockton, \$79,999.25; McDonald and Maggiora, Sausalito, \$81,074.10; McGillivray Const. Co., Sacramento, \$62,618.50; Frederickson & Watson Const. Co., Oakland, \$70,764.78; Holdener Const. Co., Sacramento, \$73,706.24; Lord & Bishop, Napa, \$91,952.25.

IMPERIAL COUNTY—Between Trifolium Drainage

Record of Bids and Awards

DIVISION OF HIGHWAYS

STANISLAUS COUNTY—Grading and paving with asphaltic concrete 20 feet wide, 0.2 of a mile, situated north of Ceres, Dist. X, Rt. 4, Sec. A. Engineer's Est. \$7,162.50. Bids opened Feb. 9th as follows: Standard Paving Co., Modesto, \$6,305; A.

Canal and Arroyo Salada Wash, 19.7 miles of drainage ditches and dykes and 8 timber bridges. Dist. VIII, Rt. 26, Sec. B.C.D. Engineer's Est. \$77,985.50. Bids opened March 7th as follows: D. A. Foley Const. Co., Los Angeles, \$72,383; Morrison-Knudson Co., Boise, Idaho, \$74,005; Grunwald & Tudor, Los Angeles, \$76,695.50; Kuhn-Lang Co., Los Angeles, \$70,050.80; Campbell-Reichert Co., Alhambra, \$65,149.60; Watson & Sutton, San Diego, \$61,577.70; Immel & Robbins, Ventura, \$63,304; Holdener Const. Co., Sacramento, \$79,151.75; George Herz & Co., San Bernardino, \$71,581; Pioneer Transfer Co., Calexico, \$62,760; M. Blumenkranz, Los Angeles, \$82,769; Charles E. Pitzer, El Centro, \$77,359.10; Vezu Bros. Stone Co., Wineville, \$99,152.50; Callahan Const. Co., Los Angeles, \$58,478; Conway & Morrow, Brawley, \$57,622.33; Butterfield Const. Co., San Diego, \$66,676; R. Johnson, Glendale, \$93,310; Ken Hodgman, Hollywood, \$124,715. Contract awarded to—

SAN LUIS OBISPO COUNTY—1.9 miles north of San Luis Obispo 0.2 of a mile to be graded and surfaced with waterbound macadam. Dist. V, Rt. 2, Sec. D. Engineer's Est. \$13,615. Sandcock Transfer Co., San Luis Obispo, \$16,093; Tieslau Bros., Berkeley, \$15,480.50; W. A. Dontanville, Salinas, \$14,393.50; J. F. Collins, Stockton, \$11,675. Contract awarded to J. F. Collins.

MADERA COUNTY—Between Tharsa and Arcola School, 6.5 miles to be paved with asphalt concrete. Dist. VI, Rt. 4, Sec. A. Engineer's Est. \$150,132. Bids opened March 14th as follows: Thompson Bros., Fresno, \$139,963; J. C. Compton, Roseville, \$145,495; A. Teichert & Son, Sacramento, \$133,299; Carl Pleasant, Phoenix, Arizona, \$140,743.50; Allied Contractors, Inc., Omaha, Nebraska, \$139,862.50; Warren Const. Co., Oakland, \$137,096.50; Valley Paving & Const. Co., Visalia, \$130,386; The Callahan Const. Co., Los Angeles, \$120,633; Force, Curigan & McLeod, Oakland, \$129,052.50.

DEL NORTE COUNTY—Between Wilson Creek and Crescent City, 15 miles to be surfaced with crushed rock or gravel. Dist. I, Rt. 1, Sec. B. Engineer's Est. \$27,145. Bids opened March 14th as follows: D. McDonald, Sacramento, \$34,190; Weber Const. Co., Crescent City, \$26,007.50; C. C. Elmore, Eureka, \$28,810; Smith Bros., Co., Eureka, \$27,870; Tieslau Bros., Berkeley, \$32,975; Montford & Armstrong, Sacramento, \$35,957.

DIVISION OF ARCHITECTURE

STATE LIBRARY AND COURTS BUILDING (Sacramento)—Mural painting work on south wall of the main reading room. Contract awarded to Maynard Dixon, 728 Montgomery St., San Francisco, \$9,500.

WOMAN'S RELIEF CORPS HOME (near Santa Clara)—Drilling and testing water well. Bids opened Feb. 7th as follows: John L. Smith, San Jose, \$843; J. Fred Holthouse, Santa Clara, \$1,100. Contract awarded to John L. Smith.

INDUSTRIAL HOME FOR ADULT BLIND (Oakland)—Addition to shop building. Bids opened Feb. 7th as follows: Office Est., \$14,072. Joe Piasecki, San Francisco, \$11,110; Jacobs & Pattiani, Oakland, \$11,221; Herbert K. Henderson, Oakland, \$11,368; John M. Bartlett, Oakland, \$11,446; J. B. Bishop, Oakland, \$11,692; Heath & Wadde, Berkeley, \$11,956; The Miner Co., Richmond, \$12,289; T. D. Courtright, Oakland, \$12,511; A. Frederick Anderson, Oakland, \$12,577; C. M. Bostrom, Oakland, \$12,867; J. A. Bryant, San Francisco, \$12,995; Spivock and Spivock, San Francisco, \$13,000; G. A. Scott, Oakland, \$13,100; Geo. Swanson, Oakland, \$13,144; Emil Person, Berkeley, \$13,293; Clancy Bros., San Francisco, \$13,460; F. R. Siegrist Co., San Francisco, \$13,600; John E. Branagh, Oakland, \$13,700; Leibert & Trobeck, San Francisco, \$13,740; B. S. MacIntyre, Oakland, \$13,760; Peter Sorensen, San Francisco, \$14,318; Sullivan & Sullivan, Oakland, \$14,490; J. S. Hannah, San Francisco, \$14,500; E. K. Nelson, San Francisco, \$14,717; E. T. Leiter & Son, Oakland, \$14,737; F. C. Amorosa, San Francisco, \$15,970. Contract awarded to Joe Piasecki, San Francisco for \$11,110.

STATE AGRICULTURAL PARK—Installation of water system. Bids opened Feb. 14th as follows: Office Est., \$17,548. James Young, Oakland, \$10,875; Latourrette-Pical Co., Sacramento, \$11,360; E. W. Redman, Fresno, \$11,795; H. Gould, Sacramento, \$12,457; W. H. Larsen, Sacramento, \$14,889; Hateley

& Hateley, Sacramento, \$15,222; Scott Plumbing Co., Sacramento, \$16,495. Contract awarded to James Young, Oakland for \$10,875.

STATE AGRICULTURAL PARK—Concrete work on Manufacturing Building repairs. Bids opened Feb. 17th as follows: Engineer's Est., \$689. A. R. Marquering, Sacramento, \$550; Olmsted, Field & Conard, Sacramento, \$616; J. F. Anderson, N. Sacramento, \$684; F. E. Provost, Sacramento, \$690; Geo. McDonald, Sacramento, \$860; C. J. Hopkinson, Sacramento, \$909. Contract awarded to Olmsted, Field & Conard for \$616.

STATE LIBRARY AND COURTS BUILDING (Sacramento)—Mural painting work. Bids opened Feb. 20th as follows: Frank Van Sloun, San Francisco, \$8,400; Helen K. Forbes, San Francisco, \$10,000; Charles Stafford Duncan, San Francisco, \$15,000. Contract awarded to Frank Van Sloun for \$8,400.

WATER PERMITS AND APPLICATIONS

Permits

Permits to appropriate water issued by the Department of Public Works, Division of Water Rights, during the month of February, 1928:

EL DORADO COUNTY—Permit 2965, Application 4182; issued to City of Sacramento, Sacramento Feb. 13, 1928, for 300 c.f.s. and 210,000 a.f. from Silver Creek and S. Fk. American River in Sec. 4, T. 11 N., R. 13 E., Sec. 20, T. 12 N., R. 14 E. and Sec. 1, T. 11 N., R. 14 E., for irrigation of 40,000 acres. Estimated cost \$29,200,000.

FRESNO COUNTY—Permit 2966, Application 5545; issued to San Joaquin Light & Power Corp., Fresno, Feb. 15, 1928, for 0.035 c.f.s. from unnamed spring in Sec. 2, T. 10 S., R. 22 E., for domestic purposes in Sec. 3.

PLUMAS COUNTY—Permit 2964, Application 5057; issued to Feather River Trust, San Francisco, Feb. 9, 1928, for 5 c.f.s. from Dogwood Cr. in Sec. 2, T. 22 N., R. 8 E., for power and domestic purposes in Sec. 35, T. 23 N., R. 8 E. Estimated cost \$15,000.

Permit 2969, Application 5232; issued to J. N. Evans Estate Co., Reno, Nev., Feb. 17, 1928, for 200 acre ft. per annum from Taylor Lake in Sec. 35, T. 27 N., R. 11 E., for irrigation and stock use on 510 acres. Estimated cost \$1,000.

RIVERSIDE COUNTY—Permit 2959, Application 4469; issued to John Terribilini, San Bernardino, Feb. 7, 1928, for 0.2 c.f.s. from underground water in Sec. 2, T. 4 S., R. 1 E., for domestic and irrigation on 30 acres. Estimated cost \$4,000.

Permit 2960, Application 4711; issued to John Terribilini, San Bernardino, Feb. 7, 1928, for 0.17 c.f.s. from underground water in Sec. 2, T. 4 S., R. 1 E., S. B. M., for domestic and irrigation on 30 acres. Estimated cost \$4,000.

Permit 2961, Application 4511; issued to H. S. Goetz, Los Angeles, Feb. 7, 1928, for 0.12 c.f.s. and 2 acre-feet from unnamed spring in Sec. 11, T. 4 S., R. 1 E., S. B. for irrigation of 31 acres. Estimated cost \$250.

SACRAMENTO COUNTY—Permit 2963, Application 5398; issued to E. C. Chatterton, Roseville, Feb. 8, 1928, for 0.5 c.f.s. from Rio Linda or Dry Creek in Sec. 23, T. 10 N., R. 5 E., for irrigation on 40 acres. Estimated cost \$700.

SAN BERNARDINO COUNTY—Permit 2970, Application 5692; issued to B. Dade Davis San Bernardino, Feb. 20, 1928, for 0.075 c.f.s. from unnamed spring in Sec. 4, T. 1 N., R. 2 W., for domestic purposes. Estimated cost \$3,500.

SAN MATEO COUNTY—Permit 2967, Application 4847; issued to Peninsula Farms Co., Pescadero, Feb. 16, 1928, for 1.5 c.f.s. from Gazos Creek in Sec. 11, T. 9 S., R. 5 W., for irrigation, domestic and fire protection on 200 acres. Estimated cost \$20,000.

Permit 2968, Application 4848; issued to Peninsula Farms Co., Pescadero, Feb. 16, 1928, for 2.67 c.f.s. from Butano Cr. in Sec. 9, T. 8 S., R. 5 W., for irrigation and domestic purposes on 880 acres. Estimated cost \$30,000.

SANTA BARBARA COUNTY—Permit 2971, Application 5745; issued to Horace O. Ensign, Newport Beach, Feb. 20, 1928, for 0.025 c.f.s. from 2 unnamed springs in Sec. 21, T. 10 N., R. 28 W., for domestic purposes. Estimated cost \$1,200.

TRINITY COUNTY—Permit 2972, Application 5616; issued to B. N. Trask, Peanut, Feb. 29, 1928, for 1.5

c.f.s. from Salt Creek in Sec. 20, T. 30 N., R. 11 W., for irrigation of 120 acres in Secs. 19 and 20. Estimated cost \$300.

TULARE COUNTY—Permit 2962, Application 5687; issued to Howell Bone, Miramonte, Feb. 8, 1928, for 0.005 c.f.s. from unnamed spring in Sec. 8, T. 14 S., R. 28 E., for domestic and industrial purposes. Estimated cost \$300.

Applications

Applications for permit to appropriate water filed with the State Department of Public Works, Division of Water Rights, during the month of February, 1928.

BUTTE COUNTY—Application 5825; Frances J. Young, Oroville, for 0.5 c.f.s. from Prairie Slough tributary to Feather River, to be diverted in Sec. 35, T. 18 N., R. 3 E., M. D. M., for irrigation purposes on 19 acres.

DEL NORTE COUNTY—Application 5843; C. R. Ward & J. L. Ward, Crescent City, for 2 c.f.s. from unnamed stream tributary to Smith River, to be diverted in Sec. 12, T. 17 N., R. 2 E., H. M., for power and domestic purposes, 27 t.h.p. to be developed. Estimated cost \$2,000.

FRESNO COUNTY—Application 5817; Miller & Lux, Inc., San Francisco, for 300 c.f.s. from San Joaquin River, to be diverted in Sec. 30, T. 13 S., R. 15 E., M. D. M., for irrigation purposes on 54,000 acres. Estimated cost \$510,000.

Application 5819; Miller & Lux, Inc., San Francisco, for 572 c.f.s. from San Joaquin River, to be diverted in Sec. 12, T. 11 S., R. 13 E., M. D. M., for irrigation purposes on 45,745 acres. Estimated cost \$203,000.

Application 5820; Miller & Lux, Inc., San Francisco, for 735 c.f.s. from San Joaquin River, to be diverted in Sec. 19, T. 13 S., R. 15 E., M. D. M., for irrigation purposes on 58,796 acres. Estimated cost \$294,000.

HUMBOLDT COUNTY—Application 5839; R. C. McCreary, Eureka, for 0.02 c.f.s. from unnamed spring tributary to Mattole River, to be diverted in Sec. 19, T. 1 S., R. 1 W., H. M., for domestic purposes. Estimated cost \$250.

KERN COUNTY—Application 5827; John L. Hooper, Weldon, for 30 c.f.s. from Kern River, to be diverted in Sec. 15, T. 27 S., R. 32 E., M. D. M., for power purposes. 33 t.h.p. to be developed. Estimated cost \$3,000.

Application 5832; J. R. Blanco, Maricopa, for 0.025 c.f.s. from unnamed spring, to be diverted in Sec. 29, T. 28 S., R. 31 E., M. D. M., for domestic and stock purposes. Estimated cost \$850.

LOS ANGELES COUNTY—Application 5846; Young Men's Christian Association, Long Beach, for 0.08 c.f.s. from Falls Canyon tributary to West Fk. San Gabriel River, to be diverted in Sec. 19, T. 2 N., R. 11 W., S. B. M., for domestic purposes.

Application 5847; E. F. Burkhardt, Littlerock, for 0.25 c.f.s. from unnamed spring tributary to Middle Fk. of Palmett Cr., to be diverted in Sec. 23, T. 4 N., R. 10 W., S. B. M., for irrigation and domestic purposes on 50 acres.

MADERA COUNTY—Application 5818; Miller & Lux, Inc., San Francisco, for 206 c.f.s. from San Joaquin River, to be diverted in Sec. 25, T. 13 S., R. 15 E., M. D. M., for irrigation purposes on 16,516 acres. Estimated cost \$75,000.

Application 5821 Miller & Lux, Inc., San Francisco, for 277 c.f.s. from San Joaquin River, to be diverted in Sec. 22, T. 13 S., R. 16 E., M. D. M., for irrigation purposes on 22,170 acres. Estimated cost \$75,000.

Application 5822; Miller & Lux, Inc., San Francisco, for 175 c.f.s. from San Joaquin River, to be diverted in Sec. 8, T. 13 S., R. 17 E., M. D. M., for irrigation purposes on 14,238 acres. Estimated cost \$131,750.

MERCED COUNTY—Application 5826; Newman Land Company, Modesto, for 10 c.f.s. from Mud Slough tributary to San Joaquin River, to be diverted in Sec. 23, T. 7 S., R. 9 E., M. D. M., for irrigation purposes on 480 acres. Estimated cost \$3,000.

MONO COUNTY—Application 5824; Champion Sillimanite, Inc., Bishop, for 2.50 c.f.s. from Milner Creek, to be diverted in Sec. 16, T. 4 S., R. 33 E., M. D. M., for power purposes. 200 t.h.p. to be developed. Estimated cost \$30,000.

Application 5831; Dept. of Natural Resources, Division of Fish and Game, Sacramento, for 3 c.f.s. from Reversed and Fern creeks tributary to Rush Creek, to be diverted in Sec. 21, T. 2 S., R. 26 E., M. D. M., for fish hatchery and domestic purposes. Estimated cost \$300.

NAPA COUNTY—Application 5841; A. Kempkey, San Francisco, for 10 c.f.s. and 10,000 a.f. per annum from Conn Creek tributary to Napa River, to be diverted in Sec. 1, T. 7 N., R. 5 W., M. D. M., for

irrigation purposes on 20,000 acres. Estimated cost \$5,000,000.

PLACER COUNTY—Application 5830; North Fork Ditch Co., Sacramento, for 35 c.f.s. and 300 a.f. per annum from North Fork American River tributary to Sacramento River, to be diverted in Sec. 23, T. 12 N., R. 8 E., M. D. M., for irrigation and domestic purposes on 5000 acres. Estimated cost \$50,000.

RIVERSIDE COUNTY—Application 5842; J. O. Blackburn, Hemet, for 0.023 c.f.s. from Bee Canyon Spring, to be diverted in Sec. 12, T. 5 S., R. 1 E., S. B. M., for irrigation and domestic purposes. Estimated cost \$1,000.

SACRAMENTO COUNTY—Application 5828; H. E. Blodgett, Rio Linda, for 0.11 c.f.s. from Dry Creek tributary to Sacramento River, to be diverted in Sec. 8, T. 10 N., R. 5 E., M. D. M., for irrigation purposes on 9 acres. Estimated cost \$350.

SAN BERNARDINO COUNTY—Application 5834; Harry L. Scott, Etiwanda, for 0.15 c.f.s. from unnamed springs, to be diverted in Sec. 9, T. 1 N., R. 6 W., S. B. M., for irrigation and domestic purposes on 80 acres. Estimated cost \$5,000.

SAN DIEGO COUNTY—Application 5835; G. M. Jones, Ocean Park, for 2000 a.f. per annum from Hellhole Creek tributary to Salton Sink, to be diverted in Sec. 11, T. 11 S., R. 5 E., S. B. M., for irrigation and domestic purposes on 600 acres.

Application 5836; Malcolm B. Woods, Los Angeles, for 75 c.f.s. and 74 a.f. per annum from Coyote Creek, to be diverted in Secs. 22 and 23, T. 9 S., R. 5 E., S. B. M., for power purposes. Estimated cost \$6,000,000.

SANTA BARBARA COUNTY—Application 5833; Lincoln H. Reed, Davis, for 0.50 c.f.s. from San Miguelito Creek tributary to Santa Ynez River, to be diverted in Sec. 4, T. 6 N., R. 34 W., S. B. M., for irrigation purposes on 7 acres.

Application 5838; Daniel J. Filippini, Santa Maria, for 0.025 c.f.s. from spring in Kelly Canyon tributary to Cuyama River, to be diverted in Sec. 34, T. 11 N., R. 29 W., S. B. M., for domestic and stock purposes. Estimated cost \$350.

Application 5840; W. H. Step, Santa Ynez, for 0.025 c.f.s. from spring, to be diverted in Sec. 32, T. 6 N., R. 29 W., S. B. M., for domestic purposes.

SIERRA COUNTY—Application 5837; Emmett H. Hurlbut, Verdugo City, for 12.50 c.f.s. from Van-Joan Creek tributary to N. Fk. Yuba via Jim Crow Creek, to be diverted in Sec. 6, T. 19 N., R. 11 E., M. D. M., for placer mining purposes. Estimated cost \$2,500.

SISKIYOU COUNTY—Application 5816; Woodfill & Barry, Sawyers Bar, for 3 c.f.s. from Eddy Gulch tributary to N. Fk. of Salmon River, to be diverted in Sec. 33, T. 40 N., R. 11 W., M. D. M., for hydraulic mining purposes. Estimated cost \$1,000.

Application 5829; Great Northern Quicksilver Mines, Inc., Oakland, for 0.75 c.f.s. from East Fork and West Fork Empire Cr. tributary to Klamath River, to be diverted in Secs. 12, 13 and 14, T. 47 N., R. 8 W., M. D. M., for mining and domestic purposes.

SONOMA COUNTY—Application 5844; Frank P. Grace Co., Healdsburg, for 1.31 c.f.s. from Russian River tributary to Pacific Ocean, to be diverted in Sec. 33, T. 9 N., R. 9 W., M. D. M., for irrigation purposes on 105 acres.

STANISLAUS COUNTY—Application 5845; Allas Investment Co., Modesto, for 14 c.f.s. from Tuolumne River tributary to San Joaquin River, to be diverted in Sec. 16, T. 4 S., R. 8 E., M. D. M., for irrigation purposes on 160 acres. Estimated cost \$1,500.

SUTTER COUNTY—Application 5823; L. Y. Mattes and C. E. Sampson, 1003 Higgins Bldg., Los Angeles, for 1.87 c.f.s. from Morrison Slough of Reclamation Dist. 2056, to be diverted in Sec. 1, T. 16 N., R. 2 E., M. D. M., for irrigation purposes on 75 acres. Estimated cost \$1,000.

Application 5849; D. C. Smith, et al., Meridian, for 20 c.f.s. from Sutter Basin By-pass tributary to Sacramento River, to be diverted in Secs. 32 and 33, T. 15 N., R. 2 E., for irrigation purposes on 2200 acres. Estimated cost \$2,000.

TULARE COUNTY—Application 5848; A. A. Bisiri, Los Angeles, for 0.001 c.f.s. from Mosquito Creek tributary to East Fk. of Kaweah River, to be diverted in Sec. 16, T. 17 S., R. 31 E., M. D. M., for domestic purposes.

VENTURA COUNTY—Application 5850; Bolsa Chica Oil Corp., Los Angeles, for 0.05 c.f.s. from unnamed spring, to be diverted in Sec. 5, T. 4 N., R. 18 W., S. B. M., for mining and domestic purposes.

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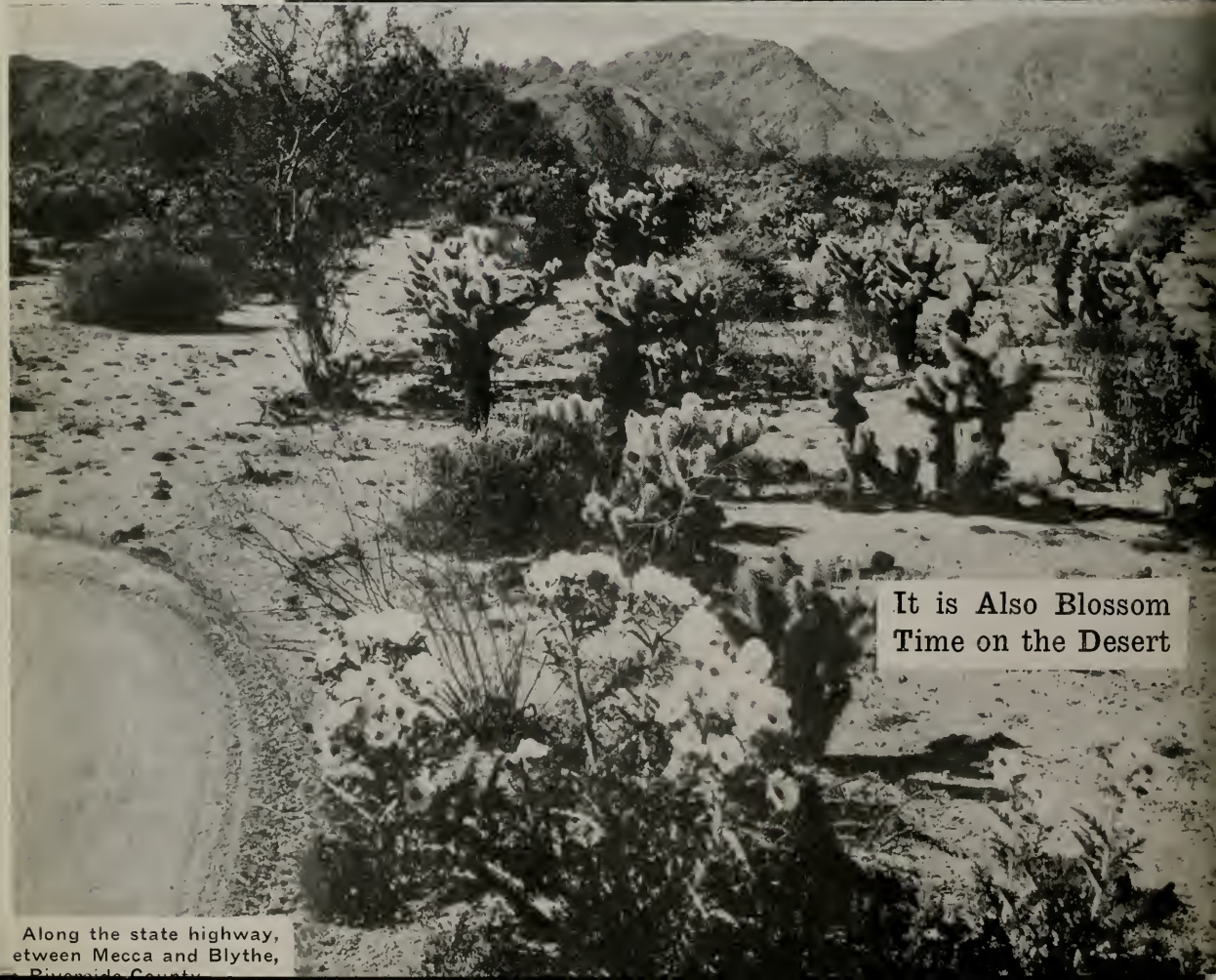
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Scene between Barstow
and Needles in San Ber-
nardino County.

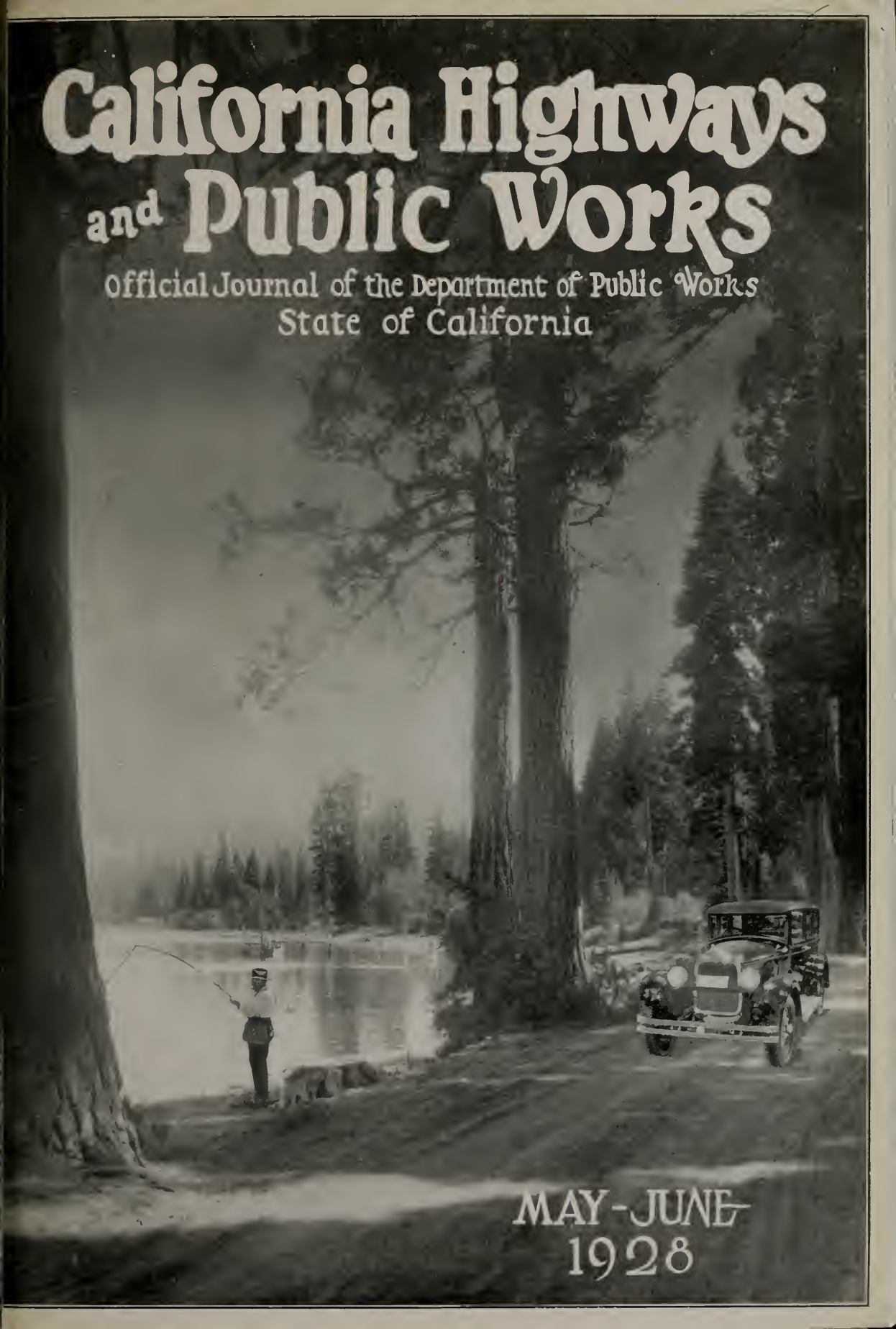


It is Also Blossom
Time on the Desert

Along the state highway,
between Mecca and Blythe,
Riverside County.

California Highways and Public Works

Official Journal of the Department of Public Works
State of California



MAY-JUNE
1928



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Superior Highways are Making Californians a Superior People

By JOSEPH M. SCHENCK, Member of the California Highway Commission.

A DISTINGUISHED French savant penned the statement many years ago that forms of government depend upon forms of people.

At that time forms of government were much more important than forms of people. Happily this situation is reversed today. The acid test now of every institution, whether it be governmental, social or commercial, is whether it makes for building better forms of people.

If the words of the French philosopher might be re-phrased in terms of modern thought, it can be said that today forms of people largely depend upon forms of highways.

This is true because the characteristics of any group of people are determined by the convenience of their transportation facilities, and the highway is the great transportation institution of our generation.

Provincialism with the narrow and ill-featured attributes of jealousy, suspicion and of backward looking standpatism is the outgrowth of too much "in-living."

Cosmopolitanism with its broader and more kindly outlook on life, its greater grace and happier optimism comes with the wider acquaintanceship and more intimate knowledge of how other people live and think that travel gives. It is the result of "out-going" rather than "in-living."

Hence it is that forms of people today are influenced and molded by their highway systems. If their roads encourage travel, the people of any section are broadened; if their roads restrict travel, both people and highways are restricted.

For some years my work has made it necessary for me to be constantly alert in looking both for types of individuals and forms of

people. The thing that has most impressed me is the extent to which isolation, which in turn means a lack of convenient transportation, is reflected in the characteristics of communities.

Conversely the fact is true that geography has little to do with the nature of a people, where isolation is not a factor in their lives.

We have a very distinctive type of mountaineer in the mountain districts, where roads are either very poor or where travel depends upon trails.

The same is true of the plainsmen. It is again true of the city dweller. All develop certain virtues and certain defects of character.

Isolation, however, tends to transform even those attributes that are good into traits, that if not evil, are at least ugly. Thus strength becomes stubbornness; tolerance is changed into intolerance; frank friendship is warped into suspicion and fear of strangers.

In business isolation and stagnation are first cousins, and always are found dwelling together.

To paraphrase another axiom, it can be said that when Isolation goes out of the window, Progress comes in through the door.

The Dark Ages ended after Western Europe traveled en masse to the Holy Lands. These crusades ended a stagnation

that had continued for centuries. They constitute but one of many instances proving that travel has been the biggest and most potent factor in the onward march of civilization.

The great thing that the highways of today are doing is to make it possible for people to move easily and en masse. Travel is no longer a monopolized luxury of the rich. It is a privilege that everybody enjoys and practices, and in whose reward of a fuller and richer life all share.



JOSEPH M. SCHENCK

Improved highways have stripped every community, be it village or city, of the strait-jacket in which isolation encased it. Nowhere else in the world is this so true as in California. There is a world of meaning in the fact that the capita ownership of automobiles is larger in California than in any other place on this globe.

The history of civilization reveals the fact the traveler tends to take to himself the better characteristics of the people he meets and to lose the more unkindly traits of his own character.

Intolerance through travel becomes tolerance. Rudeness is transformed into courtesy. The fear of new ideas and unfamiliar ways is lost, giving place to an attitude of open minded receptivity to thought or practices that at first may be strange.

As we have in California every type of topography, so we have every kind of people. Traveling back and forth from mountain to desert, and from the sea to the forests, the whole people intermingle freely. The beneficent influence of travel can not but have a mass reflection.

California is destined to develop a people such as the world has never before known. The process of this development is now well under way.

The rugged strength of the mountaineer is found combined with the urbanity of the city dweller. To the dwellers in the city is coming the greater sincerity that first-hand knowledge of the great outdoors gives, a sincerity that the more artificial life of the city tends to destroy.

The philosophy that life on the desert engenders is melding with the industry that living on the plains promotes. The love of art and culture that is first found in the commercial cities of the coast is being freely shared with the hinterland.

California's good roads are the biggest thing in the state.

Superior highways are making a superior people.

And the end is not yet.

Peggy—"Daddy, what did the Dead Sea die of?"

Daddy—"Oh, I don't know, child."

Peggy—"Daddy, where do dreams go when you wake up?"

Daddy—"I don't know."

Peggy—"Daddy, why did God put so many bones in the fishes?"

Daddy—"I don't know that either."

Peggy—"Goodness, daddy, who made you an editor?"—*Watchman Examiner.*

13³/₄ Billion Miles Traveled in 1927 By State Autoists

How many miles did the motorists of California travel in 1927?

The answer is 13,738,693,500.

These interesting figures are given by the American Road Builders Association.

The consumption of gasoline by California motor vehicles during 1927 was 1,071,681,000 gallons. The average consumption of gasoline is estimated at 13.5 gallons. That makes the total mileage traveled by California motorists but slightly under 13³/₄ billion miles.

It is interesting to note that California was first in the amount of gasoline used. New York ranked second with 892,800,000 gallons. The average national consumption per motor vehicle was approximately 550 gallons. The total number of miles traveled estimated on a basis of 13.5 miles per gallon was placed at more than 150,000,000,000 miles.

The average motorist during 1927 used 550.9 gallons of gasoline and traveled an average of 7437 miles.

The average per capita consumption in California was 642 gallons and the average mileage traveled, 8667 miles.

The highest per capita consumption was in Georgia, the 260,079 vehicles averaging 739 gallons during the year, while the lowest was in Minnesota, the 607,725 vehicles using an average of but 359 gallons, or slightly less than half the per vehicle consumption in Georgia.

"Many things contribute towards the wide variation in the amount of gasoline used per vehicle in the various states," according to J. Borton Weeks, president of the association. "In the wide difference between the amount consumed by the average motorists in Minnesota and Georgia, the primary reason is climatic conditions. In Georgia automobiles are used the year around, while in Minnesota they are restricted. Again roads in Georgia are not as good as those in the northern states and hence the gasoline consumption is higher."

"The ratio of good roads to gasoline consumption is not as marked as one would suppose, for the reason that in states where roads are good the mileage is more per gallon, and in most instances the states that have good roads are wealthy and one of the unique angles of per capita gasoline consumption is that in the wealthy states, where many owners own two cars, the per capita consumption is lowered by virtue of this fact." President Weeks points out.

"This is particularly true of California, which has excellent roads and an all-year motoring climate. With these two factors one would suppose the per capita gasoline consumption there would be the highest, however, with a per capita gasoline consumption of 642 gallons California ranks fourth on the list. Following Georgia, Louisiana ranks second with 721 gallons and Alabama third with 697 gallons.

"Additional factors accounting for the variations, is that of population, gasoline consumption being heavier in thickly populated areas such as cities and industrial centers, while tourists account for a high per capita consumption. As an example, in the District of Columbia—where there is a large annual tourist movement—the average is 79 gallons above the general average."

Present Status of State Highway Development in California

By C. H. PURCELL, State Highway Engineer.

THE first state highway activity in California was the legislative act road known as the Tahoe wagon road, Statutes of 1895. California inaugurated the state highway system by the bond act of 1909, which was voted in 1910 and funds made available on January 1, 1912. A total bond issue revenue of \$74,112,243 has been available. In 1921 the first gasoline tax measure was proposed in the legislature and defeated. In 1923, however, a 2-cent gasoline tax was passed, 1 cent of this going to the counties and 1 cent to the state. The state was restricted in the use of its share of this tax to widening and reconstruction activities. At the same time, the legislature amended the horsepower tax, making a straight charge of \$3 on machines and a graduated charge on trucks. The legislature of 1927 enacted a 1-cent gasoline tax to provide funds for new construction. The funds available have been augmented by the various federal aid highway appropriations and forest funds. However, the forest funds have been largely expended off the state highway system.

Each bond issue added additional mileage to the state highway system and we find the mileage increasing with each bond issue, until the total mileage in the state highway system at the present time is 6589 miles.

TOTAL EXPENDITURES

The total expenditure upon the California highway system up until the time the pay-as-you-go plan was adopted was \$158,236,000. Of this \$22,520,770 was federal aid money received or applied for, and \$4,632,611 was forest funds expended or obligated on the state's system. The federal aid money represents approximately 711 miles of road and the forest funds 152.7 miles.

TRAFFIC INCREASE

During the time of the various bond issues and gasoline tax measures, motor transport had a rapid development. We find 28,600 motor vehicles registered in California in 1909; in 1914, 123,516; in 1919 the number increased to 505,180. For the calendar year 1927 vehicle registration totaled 1,736,767. It will be noted that at the inception of this highway development, there was one car to every 83 persons. California now has one car to every $2\frac{1}{2}$ persons.

CONTROL POINTS

Each road added to the system under the bond issues had certain control points, no doubt many of them placed there due to the necessity of securing the proper support for such measures. These control points in many instances still exist and some of them are located on heavy traffic highways. No doubt the engineers of the past realized that some of these control points would be troublesome in the future. However, they could not have pictured such an enormous increase in highway transport.

LOCATION FACTS

A study of the situation today indicates that some sections of highway on the state system do not as well serve state traffic as more direct routes that have been developed by counties. While this is by no means general, there are several startling examples where county roads, if brought to a comparable standard of improvement to the state highways, would supersede them as state arteries. However, the highway system as originally planned and developed, has more or less successfully carried the motor transport of this most rapidly developing state.



C. H. PURCELL.

RECONSTRUCTION PROBLEMS

Various reports indicate that highway traffic increased so rapidly that there was a period between 1920 and 1923 when reconstruction of the improved highways and the maintenance thereof became a serious problem. There were no funds available, and much of the constructed mileage was rapidly depreciating. Prior to this condition, mileage had been the big factor, and the pressure for highways in the presence of a rapidly growing motor transport led to large mileages of narrow 15-foot thin type pavement.

BETTER INFORMATION

The highway officials of the present time have better traffic facts to assist them in solving their problem of highway standards and order of improvement. Engineers now generally agree that the 10-foot traffic width is the correct one for single line movement. With these established facts and the knowledge that motor transport will increase henceforth more closely with the population, the location and design of the various sections of highway can be determined upon on a better economic basis.

PRESENT PROBLEMS

Reconstruction, involving thickening, widening, relocation and maintenance of highways is provided for by the reconstruction fund, derived from the 2-cent gasoline tax and the motor license fees. The estimated revenue for the present biennium from this source is \$27,100,000 for the biennium. The pressure for this type of construction will probably continue for many years. A situation similar to that of 1920 will not again develop if highway engineers use the knowledge now available in the designing and planning of our reconstruction work. The very rapid growth of the metropolitan areas of this state has produced a reconstruction problem to care for traffic that is still acute. Roads of this type frequently take the form of city streets. In connecting large centers of population it is clear that the highways become such important traffic arteries that traffic can not economically follow the devious, indirect routings which were satisfactory for the original county highways. The development of the highway system is parallel to the development of a railroad system, where the crooked, light roads of the early days have given way to realignment, heavy construction, long tunnels and other engineering developments, all designed to make transportation more economical and reduce mileage.

BUDGET SYSTEM

The present administration of the state is operating under the budget system. The first detail budget of highway funds was submitted to the Governor and passed for the fiscal years 79 and 80. The basis of this budget was necessarily largely preliminary estimates, some of them only guesses as to the amount necessary for a proposed improvement, no definite final plan of the improvement having been made. However, estimates have been revised and the present contracts are being let as near as possible to carry out this budget program.

PREPARING NEXT BUDGET

The district engineers have submitted a tentative construction budget for the fiscal years 81 and 82. Authority will be given on projects which will be considered at the time of preparing the budget for surveys and plans, to be prepared to at least the stage where a sufficiently accurate estimate can be made to insure adequate funds for construction without allotting an excess. In other words, definite surveys wherever possible will be made the basis of our construction budget. In line with this, an estimated anticipated revenue from all sources has been prepared. This applies to both the reconstruction fund, derived from the 2-cent gasoline tax, and the new construction fund, derived from the 1-cent gasoline tax.

STATE HIGHWAY DATA

At the present time, the state highway system has an unimproved mileage of 2369; and an improved mileage, (various stages of improvement) of 4220. Out of funds available during the present biennium, 79th and 80th fiscal years, it is expected that the following improvements will result:

	<i>Paved</i>	<i>Graded</i>	<i>Total</i>
Construction -----	20	265	285
Reconstruction -----	130	58	188
Total -----	150	323	473

Available for new construction in addition to the reconstruction and maintenance fund is the 1-cent gas tax which will produce a total revenue of \$15,100,000 this current biennium.

We expect to put under contract by July 1st approximately \$7,500,000. Further contracts will be let approximately at the rate of \$2,000,000 a month after that date.

RESEARCH WORK

While engaged in this intensive construction program, it is the plan that research

(Continued on page 22.)

Progress Made on Pavement Construction During the Year 1927

By EARL WITHYCOMBE, Assistant Construction Engineer, Division of Highways.

SMOOTHNESS of the pavements constructed during 1927 maintained the same high standard set by the 1926 construction record. With the use of mechanical means of spreading asphaltic mixtures on one entire project and on portion of another, the average of roughness on this type of pavement was reduced.

Strength of concrete has been materially increased over previous records. The field men have acquired a more thorough understanding of the principal factors contributing to the strength of concrete. The average mixture of this year was a much more plastic and workable mix than during 1926.

Following is a detailed review of the 1927 California state highway paving projects.

CONSTRUCTION METHODS

Portland Cement Concrete. Finishing of concrete followed the same general method as outlined in the 1926 summary.

During the latter part of 1927 it was decided to adopt the use of marginal steel for the purpose of preventing corner breaks at contraction cracks within the slab panels. Adoption of dowels has minimized the corner breaking at expansion joints.

Standardizing on the provision for one-half inch expansion joints at intervals of sixty feet, with two intermediate transverse weakened plane joints, has broken the slab into 20-foot panels of 10-foot width. It is expected

that this type of construction will practically eliminate uncontrolled contraction cracking. Such construction is not yet of sufficient age to draw definite conclusions, but early results appear very favorable.

The increased number of joints presented difficulty in construction to secure a smooth riding surface and only through careful supervision and constant vigilance of the resident engineers and their assistants was this roughness kept down to a very slight increase over the previous year's record.

ROADS OPENED EARLIER

A marked change has been made in the time of opening concrete pavements, which has proven a great convenience to the traveling public. The watering period has been cut to eight days, after which the earth blanket used in curing is removed and the pavement is permitted to dry until opened. During the progress of placing concrete, beams are cast at half-mile intervals and, after curing, are broken in a portable machine designed at the suggestion of C. S. Pope, Construction Engineer, by C. L.

McKesson, Materials and Research Engineer. The time at which the pavement is opened to traffic depends upon the strength developed in the beams.

This procedure has saved the traveling public many thousands of dollars in motor vehicle operating costs in addition to convenience, by permitting the early use of pave-

HIGHWAY CONSTRUCTION RECORDS MADE IN 1927

The following jobs established records during 1927:

Smoothness of Pavement

With respect to smoothness of pavement Contract M-139 in San Bernardino County, Sam Hunter, contractor, E. R. Brown resident engineer, is pronounced as smooth as any Portland cement concrete pavement yet laid in California. In asphaltic concrete, Contract 96FC1, Kern County, Force, Currihan & McLeod, contractors, P. L. Wilcox, resident engineer, has the record for smoothness for machine spread pavement, and Contract DM-253, Los Angeles County, Southwest Paving Company, contractor, J. M. Lackey, resident engineer, has the record for hand spreading.

Compressive Strength

Exceptionally high average compressive strengths were obtained on Contract 525 in Orange County, Matich Brothers, contractors, R. D. Kinsley, resident engineer, and on Contract M-168 in Alameda County, H. M. Ball, contractor, F. C. Fosgate, resident engineer.

Production

Contract M-151, in Ventura County, J. F. Knapp, contractor, C. N. Ainsley, resident engineer, has the record for daily yardage in concrete placed for any work to date on the California system of highways. Contract M-161, in Merced County, Allied Contractors, Inc., contractor, H. B. LaForge, resident engineer, was the record job for asphaltic concrete production in 1927.

ments that might otherwise be kept closed for an arbitrary period under ordinary specifications.

No marked change has been made in equipment for this type of construction. Concrete mixers have been universally standardized at a cubic yard capacity, and all other units brought up to this output.

ASPHALTIC CONCRETE

Improved methods of spreading are responsible for the increase in smoothness of asphaltic concrete construction. During the past year and a half, experiments were carried on within the department to eliminate the imperfections resulting from hand spreading. The methods worked out with crude hand and horse-drawn implements were incorporated on one of the mechanical finishers used ordinarily on concrete work, and the machine was tried out on two asphalt concrete projects during 1927.

Where mechanical means of spreading were not available, a marked improvement has been made on hand work by following up with a five-foot, long-handled lute operated transversely across the uncompressed surface. This method tends to eliminate the sharper irregularities remaining in hand-raking.

SMOOTHER PAVEMENT

On contract 96FC2 in Kern County, three methods of spreading were employed with the following results: 0.9 mile of hand work averaged 24.2 inches of roughness per mile, 4.41 miles of hand work followed by a lute averaged 18.6 inches per mile, and 3.32 miles of machine finish averaged 16.4 inches per mile. It can be said, in support of the machine, that this portion of the work was performed during cold weather and would necessarily be rougher than work performed under more favorable conditions.

On contract 96FC1, again in Kern County, where machine finish was used throughout, the average roughness of the entire job was 13.9 inches per mile. On the three miles constructed in summer weather, the average was 12 inches of roughness per mile, while the remainder of the job built in comparatively cold weather, averaged 14.7 inches.

OTHER IMPROVEMENTS

After a year of experimenting, the high filler content mixture has been adopted as the standard and all but two of the projects constructed this season were of this type. This mixture is a modification of the original

"C-A-L-I-F-O-R-N-I-A" TELLS THE WHOLE STORY ON AUTO LICENSE PLATES

CHARLES A. WHITMORE in Visalia Times-Delta.

The automobile license plates of Idaho are shaped like the famous Idaho potatoes, while Massachusetts is in the form of the much lauded Massachusetts cod fish. A Wisconsin newspaper man suggested the dairy cow be honored on Wisconsin plates. Another newspaper writer suggests that drivers found hogging the road should be given a plate stamped in the form of a large fat hog. And so the suggestions continue.

It would be difficult for California to adopt any plate that would typify all of the resources and attractions of this state. Fortunately there is no need for our doing this. The word "California" tells the whole story and the whole world knows what it means.

experiments by Abson of Chicago along the same line.

The surface finish accomplished by rolling asphalt coated screenings into the freshly compacted surface, has been adopted as standard California practice. Apparently, the larger the screenings, the better the results, and material passing $\frac{1}{2}$ -inch and retained on $\frac{1}{4}$ -inch sieve is now used for this purpose.

Other than the mechanical means of spreading, no radical changes have been made in equipment in use on asphaltic concrete pavement this season.

RESULTS OF LABORATORY ANALYSES

Portland Cement Concrete. The average compressive strength of pavement concrete this season was 4508 pounds per square inch, the average for shoulder concrete was 3494 pounds and the general average of concrete strength for both pavement and shoulders was 4440 pounds per square inch, an increase of 295 pounds over 1926 construction.

Pavement concrete varied in average strength on individual contracts from 3740 pounds to 4944 pounds, a total variation of 1204 pounds. The total variation in 1926 was 2160 pounds, indicating that much more uniform results were secured in 1927 construction.

Asphalt Concrete. Voids in pavement mixtures varied from 7.4 to 1.8 per cent as found by relative specific gravity determinations. This density is somewhat lower than the 1926 results and is due, to a large extent, to the high filler content. Experiments have shown that this mix, although more stable

(Continued on page 20.)

Breaking the Newhall Bottleneck

By S. V. CORTELYOU, District Engineer, Los Angeles

THE survey for a new entrance road to the San Fernando Valley from the north has been completed. While financial and legal phases of the project are yet to be determined, the survey has shown that this will relieve the many traffic jams that have occurred in the past between Saugus and San Fernando.

The survey is for a new road over that portion of the route lying outside of the city limits of Los Angeles. The survey and preparation of plans for sections within city territory will be ready soon.

State, county and city engineering departments and the Automobile Club of Southern California have been working on a traffic congestion relief plan through the Newhall Pass for more than a year. This plan is declared to be the most logical yet devised.

DISTANCE REDUCED

The new road will leave the "Ridge" road about midway between Castaic and Saugus and extend southeasterly into and through Gavin and Weldon canyons to a junction with the San Fernando road just south of the viaduct over the Southern Pacific Railway at Tunnel Station. In addition to improved alignment and the elimination of a dangerous grade crossing for San Joaquin Valley travel, the new road will shorten the distance between the points mentioned about 1.2 miles.

From a point on the San Fernando road just north of the viaduct over the Southern Pacific Railway at Tunnel Station, it is the intention to extend a new road along the northerly side of the railway tracks to a point a short distance below the Cascades on the aqueduct. From this point the road will continue easterly to a connection with the state highway at the north city limits of San Fernando.

SOUTH ROUTE PLANNED

From a point on the south roadway near the Cascades it is proposed to extend a new highway south through the San Fernando Valley and the Santa Monica mountains to the west coast; there to connect with the state coast highway extending from Oxnard to San Juan Capistrano.

Contracts for the widening and repaving of San Fernando road between Tunnel Station and San Fernando and between San Fernando and Burbank have recently been

awarded; also, the state is planning extensive improvements in the present road through Newhall tunnel and pass.

These improvements, when completed, will enable travel to enter the metropolitan area of Los Angeles from the north with a minimum of interference and will permit of a distribution of travel from the upper end of the San Fernando Valley direct to points of destination without the inconvenience and annoyance of passing through already congested districts. This improvement will be of inestimable value to southern California.

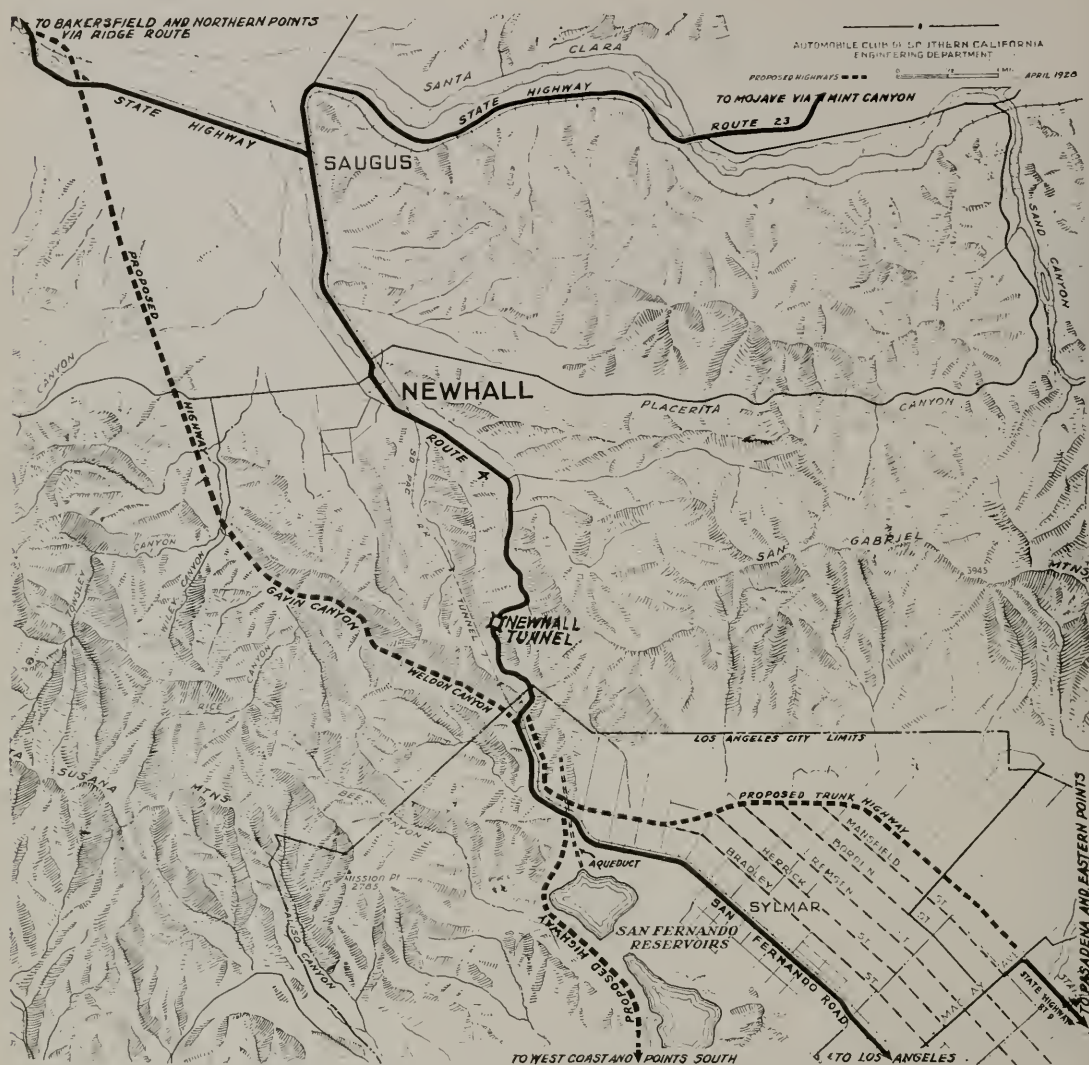
The improvements noted above will be constructed by the state and city and county of Los Angeles. The state work will be confined to that portion lying without the city limits, and the city and county to that portion within the city. The two divisions of the work, however, are inseparable and the state will not expend money upon its section until definite assurance has been made that the city and county will carry out their part of the plan, for travel would still be "bottlenecked" at and below Tunnel Station.

Walled in as it is on three sides by the San Gabriel, Santa Susana and Santa Monica mountains and the Pacific Ocean, Los Angeles County is vitally concerned in maintaining adequate entrance roads. Entrance from the north is confined to the Cajon and Newhall, and from the west to the Santa Susana and Calabasas passes.

The Newhall Pass is of particular importance to the south. Since that memorable day in December, 1854, when Phineas Banning, seated on the box of a Concord stage drawn by six mustangs, drove over the old pack trail to the summit and "nose-dived" down the north slope, this route has been the only direct connection between Los Angeles and the San Joaquin Valley.

Fort Tejon was established in 1854, and following Banning's adventure the merchants of Los Angeles were quick to see the trade possibilities in this route and set about to raise, by public subscription, funds to construct a wagon road over the Newhall Pass. By February, 1855, the road had been improved and in that month the first wagon train, forerunner of a mighty commerce, passed over the new road en route to the fort and the Kern River country.

From 1910 to 1913 the present road and tunnel were constructed by Los Angeles



MAP SHOWING LOCATION OF SUGGESTED HIGHWAY

County through a bond issue. That part of the road lying between Saugus and the north city limits of Los Angeles was made a part of the state highway system in 1916 and is maintained by the state. The original improvement, however, remains as constructed by the county.

In 1910 when Los Angeles County started the improvement of the Newhall Pass, there were registered in California, 44,132 automobiles. The population of Los Angeles County in that year was 504,131.

In 1927, Los Angeles County registered 689,902 automobiles and the population of the county was estimated to be more than 2,250,000 people.

A traffic census taken for a 24-hour period in August, 1920, by the Automobile Club of

Southern California, showed a total of 1207 vehicles using the San Fernando road between the north city limits and Saugus. A recent traffic check on this section shows a total of 23,150 vehicles during a 24-hour period.

It will be noted that the plan contemplates the ultimate extension of the principal streets of San Fernando westerly to an intersection with the proposed trunk highway. This will enable travel to filter into San Fernando and points along the northerly side of the Southern Pacific tracks along more direct lines. It is coming to be generally recognized that congestion on business streets tends to depreciate property values and encourages the development of business centers in less congested localities.

New Construction Problems

By C. S. POPE, Chief Construction Engineer, Division of Highways.

THE Division of Highways is confronted at this time with the task of planning and executing under contract, highway projects which will require an expenditure in excess of thirty million dollars for the biennial period beginning July 1, 1927, and ending June 30, 1929.



C. S. POPE.

The task may be visualized in the statement that there have so far been programmed in excess of 150 major projects, not counting bridge projects or grade separations.

These major projects range in estimated cost from \$50,000 to \$60,000 to more than \$800,000 allotted to a single project. In addition, some 250 to 300 minor projects rang-

ing from \$10,000 to \$50,000 will be carried out during the biennium.

The construction problems involved in the proper handling of these projects are two-fold.

On the one hand we have the problem of designing the physical details of the project in the best possible manner and, on the other, the securing and training of a personnel of engineers and inspectors competent to supplement the experienced and trained men already in the employ of the Division of Highways.

A brief statement of present practices may be of interest.

MATERIALS SURVEY

At the present time, all highway projects are given a most thorough engineering examination before plans are undertaken. Material surveys are conducted showing the character of the soil and its proper treatment, also the location and availability and quantity of construction materials of all kinds.

A traffic survey is maintained at uniform intervals of time from which predictions of future traffic may be made with reasonable accuracy.

An accurate system of costs of maintenance of different sections of highway is of great value in determining the details of con-

struction which should be specified especially on reconstruction work.

The determination of types of pavement to be used on both new construction and on reconstruction offers a fertile field for both study and argument.

GENERAL PROBLEMS

The general problems with which the department is confronted offer a great variety of unusual conditions to be met. Three projects may be cited showing the diversity of obstacles to be overcome and their importance to the success of highway construction.

One project which we have in contemplation is the construction of a section of highway from Soda Springs westerly on the trans-continental route from Auburn to Reno. This road is located in the snow country at elevations of 6000 to 7000 feet, and the problem is to design a road which will not only adequately serve traffic as to grade, alignment and scenic features, but will also offer the greatest freedom from obstruction during period of snow fall. So insistent is public demand that roads be kept open at all times that there is a constant pressure for large expenditures for snow removal on roads which are relatively unimportant. The problem on the road in question will be met by keeping the grade as high as possible, avoidance of heavy cuts and a tendency towards widening all cuts as much as possible with ample drainage facilities. The removal of trees which shade the roadbed is also important since it will save the state large sums of money if we do not have to remove caked ice from the highway. Also, it is necessary to provide eventually, a hard surfaced road for the full width of the graded section in order to secure proper support for the operation of snow removal machinery.

A second problem is the protection of the road from Santa Monica to Oxnard against the erosion of the sea. This is a road of great importance and also great scenic beauty but its location is such that the expenditures for shore protection may become very serious. Experimental structures in the way of groins, riprap, concrete slope paving or other devices are all receiving attention in the hope of working out an economical and successful type of structure for this location.

(Continued on page 24.)

Santa Ana River Bank Protection Work

THE Division of Highways recently completed the construction of 2000 lineal feet of protection work along the east bank of the Santa Ana River, at the State Highway Chapman avenue bridge in Orange County.

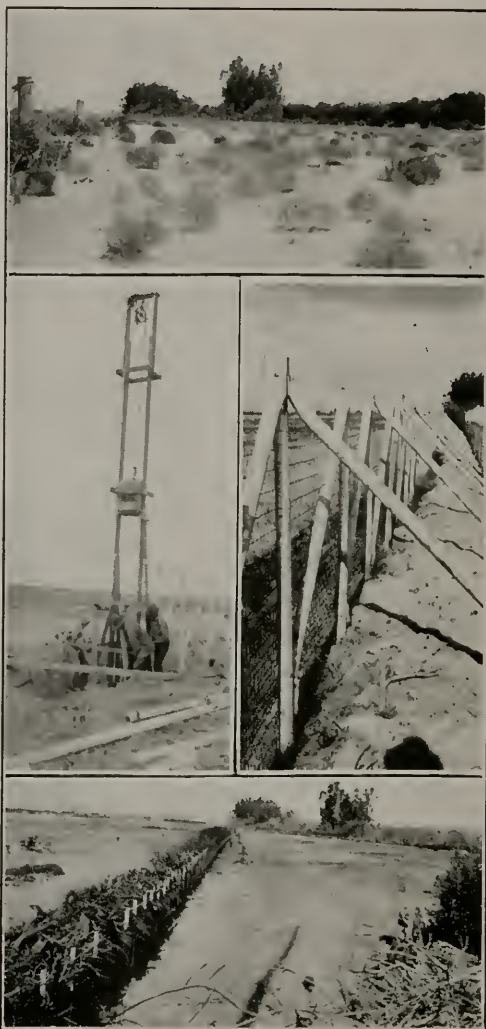
Flood waters of February, 1927, cut out a large area of land along the east side of the river channel just north of the state highway bridge and inundated the highway for about a mile, closing the road to traffic for nearly a day, and flooded residences and places of business. Serious cutting occurred at the east approach to the bridge, where the embankment was menaced for several hours.

A timber pile and wire revetment, constructed by local interests, which extended along the east river bank from the bridge abutment 2000 feet upstream to a grove of eucalyptus trees was washed away by the flood. The wooden piling had rotted at the ground line and was broken off by the force of the flood water.

As it was necessary to replace the revetment which had been washed away, in order to safeguard the state highway bridge and prevent the recurrence of the flooding of the highway as well as private property along the east bank of the river, a plan was proposed by District Engineer S. V. Cortelyou which was accepted by the Olive and West Orange Protection District, in whose territory the flooded area was located. The cost of the work was shared equally by the state and the protection district.

Work consisted of the construction of 2000 lineal feet of double fence of pipe posts and woven wire and brush, bank protection. In addition to the 2000-foot line, two 50-foot wing offsets were constructed at the upstream end to serve as a second line of defense against the entrance of the stream behind the protection work.

The protection work was constructed along a straight line extending from a point 2000 feet upstream to the east abutment of the Chapman avenue highway bridge. Posts, which were spaced 6 feet on centers both longitudinally and transversely, consisted of 3½-inch O.D. tubing galvanized. The posts were approximately 20 feet long and were driven into the ground 13 or more feet and projected above the ground surface 6 feet.



Top view shows bank destruction; center views, pile driver and fence; bottom view, completed revetment.

Diagonal braces made of the same size tubing were placed on the front line or river side in each panel, and were used on each alternate panel transversely from the front line of posts to the back line of posts, affording rigid construction. Galvanized ½-inch bolts were used to fasten the braces in place.

Along the row of posts on the river side there was placed 8 feet of Ellwood Type "I" fencing, which was composed of two 58-inch widths of the fencing which were lapped 20 inches at the ground line, where the

(Continued on page 25.)

Keeping Books on the Highway Budget

By E. Roy Higgins, Chief Accountant, Department of Public Works.

THE PLANNING of an accounting system broad enough to meet present and future fiscal and statistical needs presents a continuous problem. Methods of highway financing have undergone a radical transition during the past few years. The policy of building roads from funds provided

by bond issues has almost universally been abandoned, and we find that generally throughout the country highway construction is being financed from current revenues provided by gasoline taxes and motor vehicle fees. The effect of this change has been to emphasize the importance of the budget as an essential instrument in the administration of highway depart-



E. ROY HIGGINS.

ments. In the accounting system of the California Division of Highways budgetary principles have been applied so as to provide through a comprehensive system of budgetary accounts the maximum of executive control over activities and expenditures.

WHAT THE BUDGET DOES

The budget which at the outset is merely a tentative financial plan based upon estimates of revenue and expenditures, becomes upon its adoption the definite authorized administrative program for the biennium. It allocates from the funds that it is estimated will be available, definite sums for the several functional activities of the Division of Highways. In connection with the allotment that is made for construction projects, a detailed statement of the specific projects to be undertaken is included. Besides providing funds for the various activities of the Division, the budget limits the expenditures to the amounts provided, and it is, therefore, necessary to incorporate the final approved budget into the accounts, and to record therein the effect of subsequent transactions.

HOW EXPENDITURES ARE AUTHORIZED

Authority to expend funds under the budget is extended to the various district offices of the Division of Highways through the medium of work orders, which are issued by headquarters with the approval of the State Highway Engineer and the Director of Public Works. They are drawn against the main functional allotments provided in the budget and constitute specific authority to the districts to incur expenditures for the purposes stated therein. The issuance of work orders is limited by the amount of the budgetary allotments, and district offices are not permitted to incur expenditures in excess of the individual work orders. There is, therefore, no possibility of the Division of Highways as a whole expending funds in excess of budget provisions.

SYSTEM OF ACCOUNTING

The accounting for expenditures of the Division is accomplished through a decentralized system of accounts which places responsibility for the accumulation of details upon the district offices. Monthly reports of accumulated transactions for the fiscal year to date are required from the districts, together with journal entries necessary to set up the monthly entries to the control accounts in central office. After giving effect to the journal entries accompanying the monthly reports, the expenditure controlling accounts in central office are in agreement with the corresponding controlling accounts in the respective districts, and reports of administration, construction, and maintenance provide the detailed analysis of these accounts.

BOOKKEEPING MACHINES

Bookkeeping machines are used in the distribution of expenditures to the analysis records of administration and maintenance, and to the construction ledger sheets under construction, as well as in the preparation of the monthly reports. As the volume of detail is very great, the adoption of machine bookkeeping has provided for the handling of transactions somewhat more rapidly than is possible by hand methods, and at the same operation mechanical proof of the accuracy of the work is obtained.

A decentralized system of accounts similar to that described above is used in connection

with equipment department accounting, the detail of which is kept in the various shop offices. Bookkeeping machines are again used to good advantage in the posting of the subsidiary stock and equipment ledgers, employee's time cards, labor cost sheets, shop invoices, and in the preparation of monthly reports.

CALIFORNIA SYSTEM APPROVED

Expenditures of the various state highway departments in the United States have increased phenomenally during the past ten years, and highway accounting has had to keep pace with this rapid growth. The natural result is that systems have developed in the various states independently of each other, and the statistics which are compiled for administrative purposes and for the information of the public, are in many cases not comparable, being based on entirely different policies in the accumulation of costs. As a step toward correcting this condition a subcommittee on accounting was appointed by the American Association of State Highway officials, meeting at Denver, October, 1927. This committee in its report stressed the need for a uniform system of accounts in all state highway departments, and made various recommendations as to procedure, organization, accounting methods, and the compilation of reports and financial statements. There is considerable satisfaction in knowing that the organization and system of the California Division of Highways appears to follow very closely the uniform system outlined in the report of the subcommittee on accounting, which was recommended for adoption in all of the states of the Union.

Highway Crew Aids In Tehama Rescue

E. L. Stump, resident engineer for the California State Highway Commission reports that a crew of his men aided in the rescue of E. D. Simpson, of Tehama, who nearly lost his life, Monday night, at the Cone Ranch near Red Bluff when his machine became stalled in the water pouring across the highway. Simpson's car was washed from the road and it was with considerable difficulty that he and the car were dragged from a perilous position when his car became lodged in debris in deep water. A 5-ton truck of the highway department was used in the rescue work.

Tells Progress in Separation of Grade Crossings

During the year 1927 the Transportation Division of the State Railway Commission passed on twenty-three applications involving grade separations. Two other separation proceedings were applied for and were pending at the close of the year.

In line with the commission's policy to remove traffic hazards at important grade crossings as speedily as possible, grade separations, or the elimination of grade crossings, were authorized and were constructed during the year at the following places: Between Alberhill and Corona, Riverside County, on the Corona and Santa Fe Railway; at Pico boulevard, Longwood avenue and Tremaine avenue in the city of Los Angeles on the line of Pacific Electric Railway; at Beverly boulevard, two miles east of Montebello on the Los Angeles and Salt Lake Railroad at Harbor boulevard; Pittsburg, Contra Costa County, on The Atchison, Topeka and Santa Fe Railway; and at Ben Ali, Sacramento County, on the Southern Pacific Railroad.

The following grade separations were authorized by the Commission on the recommendation of the Transportation Division but have not yet been completed, at the following locations: At Rio Oso, Sutter County, on The Western Pacific Railroad Company's line; at Murray avenue near La Mesa, San Diego County, on San Diego and Arizona Railway; on state highway at Galivan, Orange County, on Atchison, Topeka and Santa Fe Railway Company; at First street, city of Los Angeles, on Atchison, Topeka and Santa Fe Railway, Los Angeles and Salt Lake Railroad, and Pacific Electric Railway; near Rincon, Santa Cruz County, on Southern Pacific Railroad; at Mossdale, San Joaquin County, on the Southern Pacific Railroad; at Forty-seventh street, city of San Diego, on San Diego and Arizona Railway Company; at Serra, Orange County, on The Atchison, Topeka and Santa Fe Railway; private road at Spadra, Los Angeles County, on Los Angeles and Salt Lake Railroad; pedestrian subway near Marysville, on Southern Pacific Railroad; at Oceano, San Luis Obispo County, on Southern Pacific Railroad; at Stinson Beach road, Marin County, on Mt. Tamalpais and Muir Woods Railway.

December, 1927, was the coldest December in Minnesota since 1886 and had more snowfall than any December since 1891, according to the St Paul weather bureau. The cold weather was general throughout the state. The snowfall varied, some places having more than the 28.5 inches recorded in St. Paul and some having less. All except a few small sections of the state, however, had a very heavy snowfall, accompanied by high winds. In spite of these unusual conditions, trunk highways in Minnesota were kept 90 per cent open during the month, a bulletin from the State Highway Department states. Only on two days, when heavy storms were in progress, were a majority of the highways closed. After both storms two-thirds of the routes were opened within three days, and all but two or three of the sixteen maintenance districts reported all routes opened within a week. Some of the districts which had heavy snowfall, but less wind, had all routes open within twenty-four hours after each storm.

100 Years After Jedediah Smith

*Retrailing on State Highways the Route That Daring Pathfinder Found
Century Ago*

By T. E. STANTON, Assistant State Highway Engineer.

THE YEAR 1928 marks not only an important milestone in the development of California's state highway system but also the 100th anniversary of the famous trip made by Jedediah Smith northerly through the Sacramento Valley and along the coast in northern California and southern Oregon.

We frequently overlook important anniversaries unless something occurs to jog our memories.

On a recent trip through northern Humboldt and Del Norte counties the writer was mentally reviewing the fact that bids had just been opened for grading the last unconstructed section of state highway in Del Norte County connecting Crescent City with the south.



T. E. STANTON.

A COMPARISON IN COMFORT

Realizing the ease and comfort with which it will be possible to make the trip by auto along the coast before the end of 1928, he was reminded of the hardships suffered by the small band of pathfinders under the leadership of Jedediah Smith just 100 years ago when they blazed a trail through unexplored territory down the Trinity and Klamath rivers to the coast near Requa and thence northerly to the Umpqua River, Oregon, where all but three of the party were massacred by Indians.

DIARIES TELL STORY

Fortunately, both Smith and one of his party named Harrison Rogers, left letters and diaries describing the route followed by the party through California. These letters and diaries have been edited with copious footnotes by Harrison Clifford Dale, Professor of Political Science in the University of

Wyoming and published by the Arthur H. Clark Company, Cleveland, in 1919, in a volume titled "The Ashley-Smith Exploration and the Discovery of a Central Route to the Pacific." Professor Dale has been quite freely quoted in this article describing the route taken by Smith and his party through California.

THE FIRST TRIP

Smith made the trip from the vicinity of Salt Lake to southern California over the Santa Fe Trail in August, 1826.

His route is difficult to follow from his confused and inadequate directions. It is over 100 miles from the point where Smith seems to have struck Sevier River, up that stream, and across the divide to the headquarters of the Virgin, which he named Adams River. According to Dale this river was subsequently named Virgin, presumably for Thomas Virgin who accompanied Smith on his second expedition.

Dr. Herbert E. Bolton, Director of the Bancroft Library at the University of California, believes that Dale is mistaken in his assumption that the Virgin River was named after Thomas Virgin but thinks that it was probably named by the Spanish after The Virgin.

Smith reached the Colorado which he recognized as the Seedskedee, or Green River, by October 5th. There is now a ferry across the river at this point.

He crossed the Colorado at Needles and followed, presumably, the present route of The Atchison, Topeka and Santa Fe Railroad, identical with what was to be the Santa Fe-Los Angeles Trail. He entered California via the Cajon Pass.

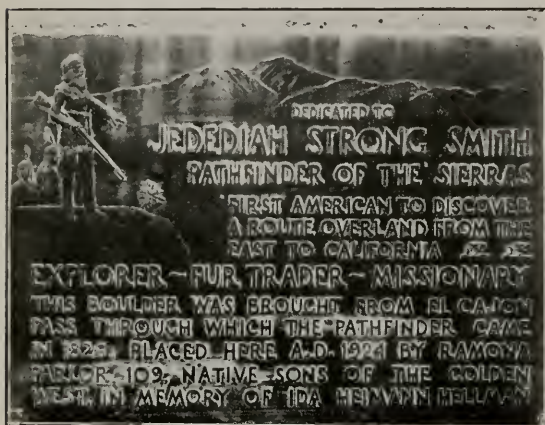
The expedition arrived at Mission San Gabriel, November 27, 1826. Upon his arrival in California Smith was looked upon with suspicion and was compelled to appear in the presence of the Governor of the Californias, residing at San Diego, where, with the assistance of some American gentlemen, he was enabled to obtain permission to return with his men by the route he came and purchase such supplies as he needed.

THE TRIP NORTH

He then started north early in 1827 and crossed the Tehachapi Range into the San Joaquin Valley. After traveling 300 miles they reached a river where they made a small hunt, attempted to cross the mountains, failed, returned to the valley and established a camp. Then Smith started again across the mountains with two men on May 20, 1827. He succeeded in crossing the Sierras in eight days, having lost two horses and one mule. Smith states that he found the snow on top of the mountain from four to eight feet deep, but it was so consolidated by the heat of the sun that the horses sunk only from half a foot to one foot deep.

ROUTE INDEFINITE

The location of Smith's route is impossible to determine with accuracy. Warner states that he followed up the American fork of the Sacramento. Richman takes him to the Mokelumne River and Chittenden to the Merced. According to Dale it seems more probable that he followed the Stanislaus, starting eastward



Inscription on Monument.

along the route followed in the opposite direction by the Bartleson-Bidwell party of 1841. The evidence for this is the fact that he named the stream the Williches from the tribe of Indians dwelling on it. The Williches live north of Kings River but certainly not as far north as the American fork of the Sacramento, which was north of the northernmost limit of the Mariposan group to which the Williches belong. On the Stanislaus River he was in the midst of a Mariposan area and he was not far north of Kings River. Again, orders were issued in October, 1827, to bring into San Francisco the trappers on the Rio Estanislao. (Governor's Orders of August 3, September 14, October 1 and 16 in Departmental Records Mss., Vol. V, 78, 88, 94, 102.) In the third place, Smith states that he traveled north 300 miles from San Gabriel, which would bring him approximately to the Stanislaus.

Assuming that, in continuing his journey, he followed up the middle fork of this river, he would pass to the south of Mt. Stanislaus (11,202 feet) (his Mt. Joseph), and on the other side of the Sierras would strike the upper reaches of the West Walker River, following down into the plains of the east, presumably passing to the north of Walker Lake without visiting that body of water.

RETURN TO CALIFORNIA

Smith returned to California over the Santa Fe

Trail with additional men in the winter of 1827, and rejoined the remainder of his original party.

During Smith's sojourn in California he and Harrison G. Rogers, the clerk of the company, kept a record of daily occurrences. Rogers' journal has been preserved. He was killed July 14, 1828, with eleven others of Smith's men, at the massacre of the Umpqua. Two of his journals, both of them fragments, have survived. The first covers the period from November 27 to December 20, 1826, and from January 1 to January 13, 1828. The second runs from May 10 to July 13, 1828. What became of the remainder of these journals is unknown.

With Smith's return in the winter of 1827, and the resumption of the journey northward in the spring of 1828, Rogers continued his diary. Day by day, during the tedious and dangerous march through northern California and southern Oregon, he diligently recorded the distance made and the direction pursued, taking pains to make his log as perfect and accurate in detail as the difficulties of an unnamed and unknown wilderness would permit.

After two years of almost constant danger, they were within easy distance of the friendly Kallipoo Indians, the Willamette River, and Fort Vancouver, the Hudson's Bay Company's post at its mouth, when Rogers and all of the company save three were brutally massacred by the Umpqua Indians, into whose hands fell all the property of the little band, including the furs, the outfit, and the journals themselves. Three refugees only, Smith, Black and Turner, made their way amid terrible hardships to Fort Vancouver, where they secured assistance from the British in securing their property.

Rogers made the last entry in his journal on July 13, 1828.

DIARIES PRESERVED

For many months the journals were in the Indians' possession. Why they did not destroy them is a mystery. Perhaps they regarded them as an unknown and powerful medicine. Finally recovered, however, they were brought out by Smith from the mountains in the fall of 1830. The following summer, after having eluded constant danger and even having escaped the massacre on the Umpqua, Smith was at last shot down by Indians on his way to Santa Fe.

Ashley, who had been made executor of his will, took possession of his papers including the Harrison & Rogers journals. Instead of returning them to Smith's relatives, who perhaps would scarcely have appreciated their value, he retained them. At his death they passed to the administrator of his estate and so to the hands of Mrs. Benjamin F. Grey of St. Louis, Ashley's grandniece, by whom they were deposited with the Missouri Historical Society where they are now preserved.

REACH SACRAMENTO RIVER

When Smith returned to California in the winter of 1827 he rejoined the remainder of his original party and, together with the recruits brought with him on his second journey to California, the party, then 21 men strong, moved slowly up the Bonaventure (Sacramento) River. Moving slowly, and at the same time passing the winter, until the 13th of April, 1828, when by examination and frequent trials he found it impossible to cross a range of mountains (Sierras) which lay to the east, he then struck off northwest, leaving the Bonaventure (Sacramento) and worked across the Coast Range until on May 10, 1828, he had reached a point on the main branch of the Trinity River, not far above the mouth of the south fork, near Burnt Ranch, Trinity County, California.

It is at this point that the second journal of Harrison G. Rogers begins, namely while the party was still in the mountains between the Sacramento Valley and the ocean.



The Jedediah Smith Monument.

ON TRINITY RIVER

Between May 10th and 26th Smith and his party proceeded down the Trinity River, called, by Smith, Indian Scalp River, making one or two attempts to cross to and follow the coast.

The first account of the interesting Hupa Indians, of Athapascan stock, who were not encountered by the whites again till 1850, is contained in Rogers' journal. The Hupas occupied the Trinity River from its mouth to Burnt Ranch. They were a powerful and important tribe, whose language was the lingua franca among most of the tribes of northern California.

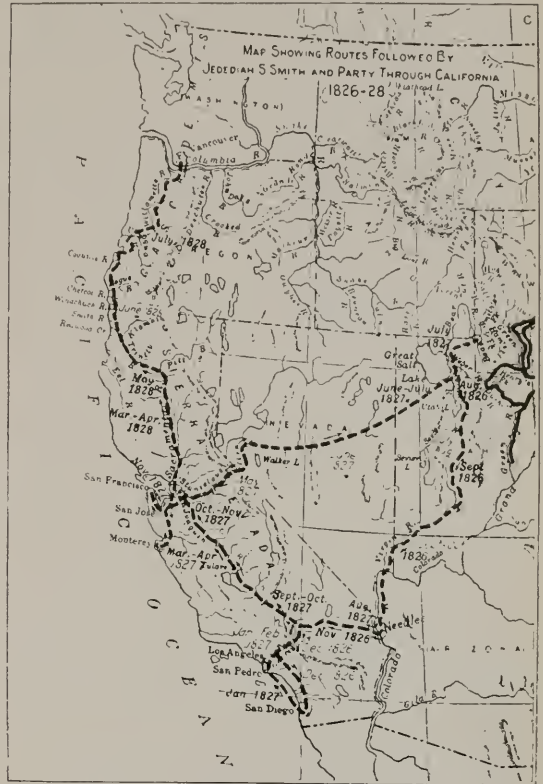
Smith and his party crossed the Trinity above Klamath and encamped on the eastern bank.

REACH THE KLAMATH

On May 27th they reached the Klamath not far above its confluence with the Trinity. The party then made its way down the Klamath with considerable difficulty and at last on Sunday, June 8, 1828, after several days of hard traveling, they reached the sea, camping north of Requa. On June 11th, following north a short distance back from the shore, they reached Wilson Creek. On June 13th, they managed to reach a point just south of Crescent City where they encamped. On the 14th, a mile from camp they struck the long neck of land called Point St. George and encamped on the side facing the open sea. On the 16th, proceeding along the point, they camped on its northern extremity near Lake Earl. On the 17th they advanced a couple of miles but, finding the ground in the vicinity of Lake Earl swamp and impassable, they returned to the higher prairie and encamped. On the 18th the same obstacles were encountered that had been encountered on the day before. On the 19th, the Smith River was discovered and on the 20th they struck Smith River some distance above its mouth, fording the stream six or eight miles from the sea. Then following the coast and crossing the numerous streams and rivers in Oregon the party reached the Umpqua River in Douglas County, Oregon, on Friday, July 11th. On the 12th they crossed the Umpqua probably above the mouth of Smith River and then proceeded in an easterly direction toward Winchester Bay. On Sunday, July 13th,

they traveled east along the north bank of the Umpqua River.

This date, July 13, 1828, is the last entry in the Journal of Harrison G. Rogers.



Map of Jedediah Smith's Exploration.

INDIAN TROUBLES

Up to this point the general attitude of the Indians towards the little party had been friendly. Smith had made every effort to keep on peaceful terms with them. By the 13th of July the worst of their journey was over. Fifteen or twenty miles of easy traveling would bring them to the Willamette Valley, whence lay an open road to the Columbia. The Umpqua Indians, moreover, seemed singularly friendly. Two days earlier, it is true, one of them had stolen an axe, which he gave up only after Smith had tied a rope around his neck. The following day the incident seemed to be forgotten for fifty or sixty Indians came into the camp to trade.

The night of July 13th, their attitude apparently changed, or else from the first Smith, despite his experience with the Indian character, had been deceived by their seeming friendliness. With their usual precautions, the men had pitched camp Sunday evening near the river. Monday morning, leaving the rest of the party still in camp, Smith after breakfast, set out on foot to find the road for the day, just as he had done many times before. The party had already crossed the Umpqua but had found the traveling on the north side of the stream unusually difficult chiefly on account of the heavy rains.

Returning from his reconnaissance, he suddenly met John Turner running frantically toward him through the underbrush. He related how soon after Smith's departure, the entire band of Indians, at the instigation of the chief who had stolen the axe a couple of

(Continued on page 23.)

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

BERT B. MEEK-----Director
GEORGE C. MANSFIELD-----Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

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DIVISION OF HIGHWAYS DEPARTMENT OF PUBLIC WORKS STATE OF CALIFORNIA

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General Headquarters, Third Floor, Highway Building,
Eleventh and P Streets, Sacramento, California.

ATTORNEY GENERAL RULES ON CONTENTS OF JOURNAL

Attorney General U. S. Webb has ruled that specific legislative consent must be obtained for the publication in CALIFORNIA HIGHWAYS AND PUBLIC WORKS of matter pertaining to the activities of the Division of Engineering and Irrigation, the Division of Water Rights, the Division of Architecture, and the Division of Ports, all being divisions of the Department of Public Works.

Such legislative sanction has already been given for the publication of information concerning the work of the Division of Highways.

In accordance with this ruling and until such time as express legislative approval may be secured for the inclusion of articles relating to the divisions first referred to, CALIFORNIA HIGHWAYS AND PUBLIC WORKS will be confined to the publication of matter relating to the Division of Highways.

It might be well to republish in this connection the thought back of CALIFORNIA HIGHWAYS AND PUBLIC WORKS as expressed by Mr. B. B. Meek, director of the Department, in the initial issue of this journal. He wrote:

CALIFORNIA HIGHWAYS AND PUBLIC WORKS in announcing its birth would also announce the reason of its being.

We believe that there is need in a state department spending many millions of the people's money for an authoritative source to which the people can go to learn officially of the projects, policies, and expenditures of such department. We plan to be such an official record for the California Department of Public Works.

There is also need in a department embracing a wide and varied scope of activities, some means through which the combined judgment and experience of the entire department can be brought to bear on problems that arise within its divisions.

We believe also that where large sums of public money are expended as is the case in this Department of Public Works that there should be a clearing house through which knowledge of developments of new methods, announcements of the results of experiments and matters of a like character may be made easily available to county and city officials in particular and the public in general.

That is why we are here. We plan to serve honestly, helpfully, loyally. We want to help you, and we want you to help us.

CONVICT LABOR ON STATE HIGHWAYS

BOARD OF SUPERVISORS

Tehama County
California

March 29, 1928.

B. B. Meek,
Director of Public Works,
Sacramento, California.

DEAR SIR: There has been quite a little unfavorable comment in regard to using prison labor on the Inskip Grade and Mr. A. N. Montgomery the chairman of our board of supervisors, requested me to write you for a statement in regard to the matter, so that we could give out some kind of a statement to our newspapers. We would like to get the information why prison labor is used and the compensation that they receive and a general statement in regard to the matter.

Trusting you will comply with this request, I am

Yours very truly,

H. M. KOPPLIN, Clerk.

Mr. Meek's reply follows:

This will acknowledge receipt of your letter of March 29th relative to the use of convicts on the Red Bluff-Susanville lateral of the state highway system.

The employment of convict labor in road construction has been a policy in force continuously in California since 1915, when the first law instructing the California Highway Commission to utilize convict labor in highway work was enacted.

The obligation to use this labor is still imposed upon the Division of Highways. The extent to which it shall amount so appropriated for the present biennium is \$600,000. This money must be used for the payment of wages to convicts, and for no other purpose.

The total state highway expenditures for the biennium are estimated at \$50,000,000. With the exception of the \$600,000 appropriated by the legislature for the payment of wages to convicts working upon state highways, the remaining portion of the \$50,000,000 will go to free labor, either directly in the form of wages or indirectly in the payment for material, supplies and equipment produced or manufactured by free labor.

It may interest you to know that but 20 cents out of each dollar goes to convicts on these so-called convict camp jobs. The remaining 80 cents is spent for superintendence, engineering and other free labor used in connection with such work; for supplies and equipment necessary thereto, and for bridges and drainage structures on these projects, which will be built by contract.

During the past winter the number of con-

viets employed on road work was kept at a low figure. The total number of convicts in the three small camps maintained during the winter was at its largest in December and then only 227 prisoners were so employed. The convict camp on the Red Bluff-Susanville lateral will use about 60 prisoners.

Over a period of years the cost of road construction by convicts and by free labor is about the same. The fact, however, that the convicts are self-supporting while at work on the roads relieves the state of the burden of supporting them in prison. The saving thus affected to taxpayers of the state on the basis of the employment of 850 men is estimated at more than \$200,000.

The convict camp work has been a very important factor in the reformation of prisoners, who through this work have been given an opportunity of accomplishing the change from prison to free life by gradual process. The hope that prisoners may be assigned to road work has been a very potent factor in making for better discipline among the inmates at San Quentin.

The history of convict road work in California is that the prisoners have built excellent roads without menace, peril, or annoyance to the communities in which convict camps have been located.

There are a number of counties now asking that convict camps be established on their roads. It is not the policy of the Division of Highways to force a convict camp upon a county, unwilling to receive it. If this should be the case with your county, please advise us of your thought in this matter. You should understand, however, that if it is deemed advisable to remove the camp from your county, the work laid out there for the convicts, of necessity, must go over at least until the next biennium as we haven't the money to finance a camp of free men on this project at this time.

A young bride asked her husband to copy a radio recipe she wanted. He did his best but got two stations at once, one of which was broadcasting physical exercises and the other the recipe. This is what he took down:

"Hands on hips, place one cup of flour on the shoulders, raise knees and depress toes, and mix thoroughly in half a cup of milk. Repeat six times. Inhale quickly one-half teaspoonful of baking powder. lower the legs and mash two hard-boiled eggs in a sieve. Exhale, breathe naturally, and sift into a bowl.

"Attention! Lie flat on the floor and roll the white of an egg until it comes to a boil. In ten minutes remove from the fire and rub smartly with a rough towel. Breathe naturally, dress in warm flannels, and serve with fish soup."

Flood Destroyed Portion of Desert Highway Rebuilt

By ALMON COONROD.

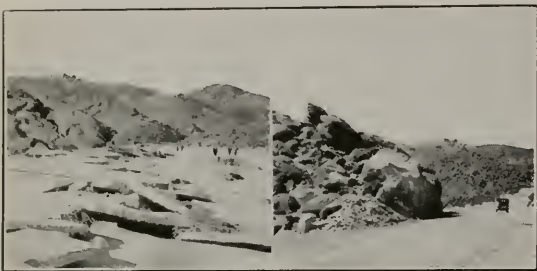
MARCH 13th of this year marked the completion of a 2.1-mile state highway grading project on the San Diego to El Centro highway at the foot of Mountain Springs grade, destroyed by a flood on December 16, 1926.

This sudden and unforeseen deluge of water was the result of heavy rains over the large

current, and the pavement settled to the floor of the wash in large broken slabs.

This flood occurred without loss of life or serious damage to property other than to the highway. Fortunately traffic was not delayed long for the water subsided after the storm and travel was resumed over the moist sand in the bed of the wash. Oil was later applied to the sand and this has served pending the completion of the reconstruction project. The new grade has been built on the hill side above the wash. It can now be used if the oiled road in the wash is destroyed by further floods, but it will not be thrown open to traffic until paved unless further floods in the wash make this necessary.

True to the history of every disaster affecting a thrifty population, the ruined highway is now replaced. Though still unpaved, the foundation is established for a better road than the old one. The new road has been relocated and built to the standards required by present day traffic; provision has been made for a grade separation at a railroad crossing, and protection work has been provided to baffle the floods which may sweep down the wash in the future.



The Wreck of the Old Road; the New Highway.

barren drainage area above. It was only one of a number of similar floods which occurred over the desert areas in this section. The earth embankments supporting the pavement crumbled and were carried away by the heavy

State's Attitude Toward Contractors Told in Manual

The manual of instructions on construction work governing all construction procedure of the Division of Highways of the Department of Public Works of the State of California, contains the following instructions relating to public attitude and relations with the contractor:

"Relations with the public should be courteous but business like and always governed by common sense. Public discussion of the policies of the Highway Commission should be avoided. Remember, always, that you represent the State of California, and that the state and the people of the vicinity will hold you responsible for seeing that the work is accomplished in such manner as to afford greatest benefit and least inconvenience to the public at large.

"Relations with the contractor and his employees should be agreeably maintained. Surliness or an overbearing attitude will not be tolerated. Be friendly to all, but familiar with no one.

"Anticipate the contractor's difficulties. Advise, but do not try to force him arbitrarily to a certain

course of procedure where the specifications permit more than one method.

"An engineer usually enforces his commands through personality. Be sure your judgment is cool, fair and impartial and your knowledge of the work so thorough that you command respect and obedience. Never argue. Refer disputed questions to your superior, and, until you hear from him, use your best judgment.

"An erroneous method, once allowed to start, is hard to stamp out. Similarly, the reputation of being slack or easy, though it is quickly attained, is difficult to overcome.

"Instructions or formal orders shall be given directly to the contractor or his authorized representatives, only. In case of minor importance, however, this rule may be modified to fit the occasion."

Motor vehicles registered in all of Russia totaled 21,035, as of July 1, 1927, according to figures furnished the U. S. Department of Commerce, 78 per cent being state owned, 7 per cent cooperatively owned, and 15 per cent privately owned. Figures compiled by the American Motorists Association show that this is one motor vehicle to every 6723 inhabitants in Russia, compared with one automobile to every five persons in the United States.

Grade Crossing Accident Report Issued by State Railroad Board

Having for its object the study of causes and conditions favoring accidents at grade crossings and on railroads and street railways, other than at grade crossings, the transportation division of the engineering department of the Railroad Commission has prepared a comprehensive report on such accidents occurring in the State of California during the years 1926 and 1927. The report has been submitted to President Leon O. Whitsell of the Commission by Mr. J. G. Hunter, chief of the transportation division, who was assisted in compiling the report by Assistant Engineer John E. Cooper, and Service Inspectors W. F. Lemon and H. L. Engelhardt.

GRADE CROSSING ACCIDENTS

As was the case in railroad accidents, discussed above, the grade crossing accident situation appears to have been more serious during 1927 than in 1926. There were 1740 accidents of this class in 1927, as compared with 1217 in 1926. The number killed in these accidents was 194 in 1927, as against 139 in 1926. There were 763 injured in 1927, and 629 injured in 1926. The majority of the killed and injured were passengers in vehicles, there being 135 killed, and 572 injured in this class during 1926, and 189 killed and 726 injured during 1927. Two of the classes of accidents listed deserve special comment, these being listed as : First, "Drove behind passing train and struck by train traveling in opposite direction." Second, "Ran into standing train." Both of these classes present peculiar conditions which the present means of protection does not seem to meet. Special study is being devoted to reduce the number of accidents under both classifications. There were 25 accidents of the first nature during 1926, in which three persons were killed and 10 injured, and 61 accidents during 1927, in which six persons were killed and 28 injured.

Under the second category where vehicles ran into trains occupying the crossing, the accidents occurred almost entirely during times of poor vision. In some cases the view of the wig-wag was obstructed by the train. The clear view under cars makes such trains rather difficult to see at night, as the automobile headlights, if properly adjusted, tend to light up the road under the car and not the car itself when it is at the grade crossing. There were 48 accidents in 1926 resulting from vehicles running into standing trains, with one killed and 27 injured, and 272 accidents in which vehicles ran into moving trains, with 15 killed and 114 injured in 1926. Under this classification there were 62 accidents involving standing trains in 1927 with 40 injured, and 319 accidents involving moving trains, with 25 killed and 139 injured.

It is interesting to note that 90 per cent of the accidents at grade crossings occur on the Southern Pacific, the Santa Fe and the Pacific Electric railroads.

Approximately 80 per cent of the total accidents covered by the report occur in city streets. The greater number of crossing accidents occur at crossings protected by crossing signs only. While this may reflect, to some extent, the lack of protection, it

District One Pays Tribute to Retiring Chief T. A. Bedford

By I. G. THOMAS, Assistant District Engineer.

DISTRICT I employees learned with the most sincere regret that their chief, T. A. Bedford, had tendered his resignation as District Engineer to accept a position with the Kaiser Paving Company in Cuba.

When, three days later, Mr. Bedford left, it was with regret that those who served under his guidance, saw him board the train and leave the service of the state which he has served for sixteen years. It was as though a big prop had been taken from beneath the District I organization.



T. A. BEDFORD.

All those who worked with him marveled at his keen judgment, his rare analysis of human nature, and enjoyed and respected his kindly supervision.

He left Eureka honored by all those who worked with him and a friend to all who knew him.

He left District I on Friday, April 13th, just 20 years since coming to California. Sixteen years of that time has been spent as District Engineer for the California Highway Commission, eleven years of which he pioneered the work in District II and the last five years in District I.

District I employees all wish for Mr. Bedford the best of all that he expects in his new venture.

is probably largely due to the greater number of grade crossings falling within this group. The comparatively large number of accidents occurring at crossings protected by wig-wags and by flagmen, 299 in 1926, and 599 in 1927 at the former; and 103 in 1926, and 98 in 1927, at the latter, is no doubt because these include the heavily traveled crossings, and those that, due to certain physical conditions, present unusual hazards, and not because of the failure of this type of protection.

Los Angeles County, with 422 grade crossing accidents in 1926, and 759 in 1927, with 47 killed and 314 injured in 1926, and 64 killed and 294 injured in 1927, led the list of counties. Alameda County was second, with 207 accidents in 1926, with 10 killed and 79 injured, and 293 accidents in 1927, with 20 killed and 129 injured.

The New York state highway department spent \$18,000,000 for new construction and \$21,000,000 for reconstruction during 1927, according to figures recently released. The construction contracts covered 315 miles and reconstruction contracts 359 miles. The average contract price on new construction was \$52,000 per mile and the average on reconstruction was \$55,000. Many of New York's highways were laid out and improved before the present standards of alignment, grades and widths had been adopted. The cost of relocation and building bridges to do away with grade crossings also enters into the reconstruction.

PROGRESS MADE ON PAVE-
MENT CONSTRUCTION DUR-
ING THE YEAR 1927

(Continued from page 6.)

than the normal mix, is more difficult to compact.

FIELD COMPARISONS

Portland Cement Concrete. Roughness as determined by the vialog average 7.8 inches per mile, an increase of 0.6 inches over the 1926 record. Considering the fact that in the majority of 1927 projects, the normal amount of joints was trebled, this is an enviable record.

Cement control varied from 0.98 per cent to 5.26 per cent and averaged 1.6 per cent. The general average in 1926 was 1.49 per cent.

The average daily output of pavement concrete for all jobs was 201.8 cubic yards as compared to 186 cubic yards in 1926. This

increase in daily averages was accomplished with but a slight increase in labor required.

ASPHALT CONCRETE

Surface roughness for 1927 averaged 22.1 inches per mile as compared to 24.1 inches in 1926.

Daily output averaged 277.1 tons in 1927 and 270 tons in 1926.

SURFACE ROUGHNESS, ALL TYPES

The average roughness has been consistently decreased since the first year in which measurements were taken. The averages in 1924 were 22.2 inches of roughness per mile; in 1925, 18.8 inches; in 1926, 15.0 inches; and in 1927, 14.2 inches.

In determining pavement roughness in the past, the Division of Highways has used an instrument known as the "vialog," developed in New York state. Recently, however, the United States Bureau of Public Roads has

RECORD OF PAVEMENT

District	County	Route	Section	Location	Miles	Contract No.	Contractor
PORTLAND CEMENT							
III	Sacramento.....	3	B	At Ben Ali Subway.....	0.37	93EC4	C. W. Wood.....
IV	Alameda.....	5	B	Livermore-Dublin.....	8.90	M-168	N. M. Ball.....
IV	San Mateo.....	2	A	Colma-Cypress Lawn Cemetery.....	1.58	94EC1	Hanrahan Co.....
V	Santa Barbara.....	2	H, J	Between Montecito and Summerland.....	1.42	95FC1	Sam Hunter.....
V	Santa Barbara.....	2	H, J	Carpinteria-Summerland.....	4.48	M-142	Sam Hunter.....
VII	Los Angeles-Orange.....	2	D & F	Michigan Ave., Whittier, to Mirada St.....	3.77	M-139	Geo. Herz & Co.....
VII	Orange.....	2	B	1 mile N. of Galivan—6.7 miles N. of Galivan.....	4.91	97FC3	Geo. Herz & Co.....
VII	Orange.....	2	C	Through Tustin.....	1.63	M-147	Griffith Co.....
VII	Orange.....	60	B, C	Through Laguna Beach.....	1.54	519	United Conc. Pipe & Const Co.
VII	Orange-Los Angeles.....	2	A & E	Bet. Naples and Anaheim Bay Bridge.....	1.50	525	Matich Bros.....
VII	San Diego.....	60	A	At Del Mar.....	0.38	97FC1	Jahn & Bressi.....
VII	San Diego.....	12	A, B	La Mesa-El Cajon.....	3.69	M-163	Geo. Herz & Co.....
VII	San Diego-Imperial.....	12	H & A	Top Mt. Springs Grade—Myers Creek Bridge.....	6.80	515	Jahn & Bressi.....
VII	Ventura.....	2	D to G	Ventura-Benham Subway.....	13.04	M-151	J. F. Knapp.....

PORTLAND CEMENT

VI	Merced.....	4	A	Athlone to S. Boundary.....	4.51	M-161	Allied Contractors, Inc.....
VI	Merced.....	4	A	Merced—Southerly Boundary.....	5.48	M-141	Allied Contractors, Inc.....
VIII	Riverside.....	26	E, F	Indio-6 miles S. of Coachella.....	8.99	M-133	Southwest Pav. Co.....

ASPHALTIC CON

III	Sacramento-Placer.....	3	B & A	Sylvan School-Roseville.....	3.06	93EC2	J. C. Compton.....
IV	Marin.....	1	B	Through Ross and Larkspur.....	2.50	M-144	Pacific States Const. Co.....
VI	Kern.....	4	E	Lerdo-1/2 mile N. Famosa.....	8.79	96FC1	Force, Curriegan & McLeod.....
VI	Kern.....	4	F	1 mile N. Famosa-1 mile S. of Delano.....	9.03	96FC2	Valley Paving & Const. Co.....
VI	Merced.....	4	A	Merced-Southerly Boundary.....	6.04	M-141	Allied Contractors, Inc.....
VI	Merced.....	4	A	Athlone-Southerly Boundary.....	4.51	M-161	Allied Contractors, Inc.....
VII	Los Angeles.....	23	F	Sierra Madre Ave.-15th St., Lancaster.....	1.00	DM-253	Southwest Paving Co.....
VIII	Riverside.....	26	E-F	Indio-6 miles S. of Coachella.....	8.99	M-133	Southwest Paving Co.....

*Laid in 10-foot widths.

perfected a much more sensitive and accurate instrument called the "Roughometer," and after extensive trials and comparisons, the latter instrument has been definitely adopted for future work.

OUTSTANDING PROJECTS

Portland Cement Concrete. With respect to smoothness, Contract M-139, S.B-2-H & J, is as smooth as any pavement yet measured in California. This project was constructed by Sam Hunter under the supervision of resident engineer E. R. Brown, now city engineer of Santa Barbara.

Exceptionally high average compressive strengths were obtained by assistant resident engineer R. D. Kinsey on Contract 525, in Orange County, and by resident engineer M. C. Fosgate on Contract M-168, in Alameda County. These projects were constructed by Matich Bros. and N. M. Ball, respectively.

From the standpoint of production, Con-

tract M-151, in Ventura County, constructed by J. F. Knapp, under the supervision of resident engineer C. N. Ainley, has the record for daily yardage of concrete placed for any work to date on the California system of highways.

Asphaltic Concrete. For smoothness, Contract 96FC1, Ker-4-E, constructed by Force, Curigan and McLeod under the supervision of resident engineer P. L. Wilcox, has the record for machine spread, and Contract DM-253, in Los Angeles County, constructed by Southwest Paving Company under the supervision of assistant resident engineer J. M. Lackey, was the record job for hand spreading.

Contract M-161 in Merced County, constructed by Allied Contractors Inc., under the supervision of resident engineer H. B. LaForge was the record job for production in 1927.

CONSTRUCTION, 1927

Resident Engineer	Average strength of concrete at 28 days, pounds per square inch.	Average yardage or tonnage laid per day.	Average daily variation in cement used, per cent.	Average interval of designed joints, feet.	Average interval of joints and cracks, feet.	Vial index of roughness, inches per mile.	Average relative specific gravity in per cent.	Type of equipment used		Remarks	District
								Mixer	Finisher		
CONCRETE PAVEMENT											
J. L. Pifer.....	3,812	124.22	1.31	19.9	19.9	5.6	-----	*Foote 27 E.....	Ord.....	Wooden headers.....	III
M. C. Fosgate.....	4,944	235.97	1.10	20.1	20.1	7.6	-----	*Koehring 27 E.....	Ord.....	Wooden headers.....	IV
H. S. Payson.....	4,679	226.23	1.14	19.9	19.9	13.2	-----	*Koehring 27 E.....	Hand.....	Wooden headers.....	IV
C. M. Butts.....	4,680	159.12	1.06	49.0	49.0	8.2	-----	*Foote 21 E.....	Ord.....	Steel headers.....	V
E. B. Brown.....	4,451	197.75	1.83	45.8	42.6	4.1	-----	*Foote 21 E.....	Ord.....	Steel headers.....	V
A. N. George.....	4,835	220.88	1.08	46.9	46.9	11.3	-----	*Foote 26 E.....	Ord.....	Wooden headers.....	VII
A. D. Griffin.....	4,194	241.60	1.01	20.3	20.3	7.6	-----	*Koehring 27 E.....	Ord & Lakewood	Wooden headers.....	VII
C. B. Montgomery.....	4,618	215.56	0.98	47.4	47.4	5.6	-----	*Koehring 27 E.....	Ord.....	Wooden headers.....	VII
A. D. Griffin.....	4,875	221.97	1.45	48.7	48.7	6.2	-----	*Foote 27 E.....	Lakewood.....	Wooden headers.....	VII
R. D. Kinsey.....	4,951	159.67	1.44	20.0	20.0	4.9	-----	*Rex 27 E.....	Lakewood.....	Wooden headers.....	VII
W. D. Eaton.....	4,192	159.66	5.26	20.2	20.2	7.7	-----	*Koehring 27 E.....	Lakewood.....	Wooden headers.....	VII
C. P. Montgomery.....	3,740	218.25	1.52	20.6	20.6	12.9	-----	*Foote 27 E.....	Ord.....	Wooden headers.....	VII
W. D. Eaton.....	4,066	202.78	2.08	40.2	40.2	8.5	-----	*Koehring 27 E.....	Lakewood.....	Wooden headers.....	VII
C. N. Ainley.....	4,376	241.95	1.13	26.8	26.3	6.7	-----	*Foote 27 E.....	Ord & Lakewood	Wooden headers.....	VII
CONCRETE SHOULDERS											
H. B. LaForge.....	3,729	168.99	0.60	-----	-----	-----	-----	Geiger A. C. plant (1 ton).....	Hand work.....	Wooden headers.....	VI
H. B. LaForge.....	3,272	105.97	0.65	-----	-----	-----	-----	Geiger A. C. plant (1 ton).....	Hand work.....	Wooden headers.....	VI
H. O. Ragan.....	3,472	124.03	2.52	-----	-----	-----	-----	Rex 21 E (5 sack).....	Hand work.....	Wooden headers.....	VIII
CRETE PAVEMENT											
F. R. Baker.....	214.71	-----	-----	-----	-----	25.0	95.6	Geiger (¾ ton).....	Hand work.....	Wooden headers.....	III
W. A. Rice.....	186.53	-----	-----	-----	-----	35.2	96.7	Geiger (1 ton).....	Hand work.....	Wooden headers.....	IV
P. L. Wilcox.....	342.58	-----	-----	-----	-----	13.9	92.8	Geiger (1 ton).....	Ord (modified).....	Wooden headers.....	VI
H. B. LaForge.....	353.39	-----	-----	-----	-----	18.1	92.6	Geiger (1 ton).....	Ord and hand.....	Wooden headers.....	VI
H. B. LaForge.....	345.84	-----	-----	-----	-----	22.6	96.7	Geiger (1 ton).....	Hand work.....	Wooden headers.....	VI
H. B. LaForge.....	365.87	-----	-----	-----	-----	20.2	95.3	Geiger (1 ton).....	Exper. rake and strike-off.....	Wooden headers.....	VI
J. M. Lackey.....	132.42	-----	-----	-----	-----	17.6	-----	Madsen (¾ ton).....	Hand work.....	Wooden headers.....	VII
H. O. Ragan.....	275.76	-----	-----	-----	-----	30.8	98.2	Madsen (1 ton).....	Hand work.....	Wooden headers.....	VIII

"Gas Tax" Future Said to Depend On How Handled

"The future of the gasoline tax rests with the discretion of the state legislatures," is the conclusion reached by F. G. Crawford, Professor of Political Science in Syracuse University, in a study of "Administration of the Gasoline Tax in the United States," which assembles information that will be useful to citizens of New York and Massachusetts, whose legislatures are considering gasoline tax bills in their current sessions, and of other states where changes may be proposed next year.

The matter is reviewed in a recent issue of the *Christian Science Monitor*.

Commenting on how the gasoline tax plan has in eight years been adopted in 46 of the 48 states, Professor Crawford says this record is unprecedented in the annals of taxation. He warns, however, that legislatures may "go too far with increases and bring a rather violent reaction to a most successful tax. There is already some tendency in this direction."

"It's success," he finds, "rests upon the low cost of collection, the diffusion of the burden on the tax bearer, and the fact that no important group has had a real economic or social motive for opposition. As a rule, the motorist is more in favor of better highways than he is opposed to the collection of this tax."

COLLECT \$225,000,000 IN 1927

The states collected a total of \$225,000,000 in gasoline taxes in 1927, according to an estimate quoted by Professor Crawford. This is approximately \$30,000,000 more than in the previous year, and is the peak of an uninterrupted increase in collections from less than \$5,000,000 in 1921, when only 13 states had the tax.

"The increase in revenue from this tax in those years is little short of phenomenal," says the investigator. "Even where the rate has remained constant the gross amount has increased steadily. Increases in rates have caused corresponding increases in yield. This, in part, answers those critics who believed increases in rates might result in evasions. The amounts collected are in themselves a reason why state legislatures have raised the rates. The query may well be raised as to how far the states will go."

"An interesting sidelight is the fact that as gasoline taxes have increased no serious change has been made in the motor vehicle tax. Apparently there is no connection and the gasoline tax is not regarded as a substitute for, but rather an addition to, motor vehicle taxes."

COMPLEXITIES IN HANDLING TAX

"A striking absence of uniformity is shown in methods of collecting the tax and in formulas for distributing and applying the money it raises. In any state which has worked out a well integrated fiscal program, this tax ought to be collected by the same authority which collects the other taxes."

The cost of collecting the gasoline tax is very low, he finds, especially where the collection is made from the wholesalers. In all the states except three in which the collection is made from retailers, the cost is less than one per cent of the revenue. An increase in the amount of the tax is found to reduce the percentage of collection costs. Complicated problems have been encountered, however, in the matter of making exemptions and refunds.

"Distribution of the gasoline tax has caused more discussion than any other single phase of the problem," Professor Crawford remarks, and shows that six different methods are in use in twenty states which return some portion of the receipts to local communities.

"Although the amounts that have been returned to the localities have increased from 1924 to 1926, the percentage of the whole amount, taking into account increases in rates and increases in collection, has actually decreased," he says. "The tendency is apparently in the direction of state control and administration of gasoline tax money."

PRESENT STATUS OF STATE HIGHWAY DEVELOPMENT IN CALIFORNIA

(Continued from page 4.)

work necessary to develop sound highway engineering standards and improvements in methods will be carried on as in the past. California's highway department has always held a high place in this branch of the work. The integrity of the construction encountered in California is a monument to the honesty and ability of the engineering organization which carried on this work. It is expected that California's engineering organization will continue to occupy the high place that it has maintained in the past.

Michigan Sets California Right of Way Example

The state highway department is acquiring land for a right of way width of 400 feet through timber land in the Northern Peninsula. The purpose is twofold, being to provide recreational areas and to preserve snow-drift-preventing stands of timber.

Automobile registration during 1927, totaled 23,125,000 cars and trucks. Comparing the registration to the miles of surfaced highways, the figures show that there are 40.2 cars and trucks in the United States for every mile of surfaced road. The total mileage of highways, including secondary roads, according to figures compiled by the American Motorists Association aggregate 3,006,081 miles. Primary highways total 575,000 miles.

The construction of an international highway, linking the United States with Central and South America, is provided for under the terms of a bill just introduced in the senate by Senator Tasker L. Oddie of Nevada. The purpose of the highway, which is sponsored by the American Motorists Association and other organizations, would not only be for better highway facilities and communication between the countries, but would be conducive of good will. Senator Oddie declared in introducing the bill.

Driver (to sweet young thing): "I can see that I'm only a pebble in your life."

S. Y. T.: "That's all. But I wish you were a little boulder."

100 YEARS AFTER JEDEDIAH SMITH

(Continued from page 15.)

days before, rushed on the encampment. Turner and Black were the only ones to escape.

REACH VANCOUVER

Smith and Turner decided to make no effort to recover the property and set out at once upon the Umpqua in the direction they would naturally have pursued. After severe hardships, finally, in the month of August they reached the shelter of Fort Vancouver, where to their surprise they found Arthur Black, who had arrived only the night before.

THE NAMING OF SMITH RIVER

There seems to be no doubt but that the Smith River in Del Norte County was named after Jedediah Smith. Evidence of this is to be found in the "Journal of the Expedition of Colonel Redick McKee, United States Indian Agent, Through Northern California, Performed in the Summer and Fall of 1851" published by authority of Congress in 1860 (see archives of aboriginal knowledge, by R. Schoolcraft, LL.D., Vol. III, pages 136-7).

On Monday, September 29, 1851, McKee's party reached the junction of the Trinity and Klamath rivers. Quoting the Journal from this point we find that—

"The Klamath River is here, during its lower stages, about fifty yards in width, and very swift. Its course, in fact is obstructed at short distances by rapids throughout its whole length, till within ten miles of the sea, the descent from the source to the ocean being very considerable. There are, however, no falls of any height; the largest, which is a few miles below the forks, being little more than a rapid. Much error has existed in maps relating to this river; its mouth having by many (among others, Captain Wilkes and Col. Fremont) been placed in Oregon, about 42° 35' N. L. and it was for a long time supposed that Rogue's River, which actually empties about that latitude, was a branch of the Klamath. The distinctness of the two streams has since been ascertained, but the source of the mistake is nowhere noticed. The manuscript map of Oregon and California by Jedediah S. Smith, which was, till lately the best source of information as to this part of the country, although in general singularly accurate, considering the extent of the region traversed and laid down by him, gave rise to it. Smith in 1828, ascended the Sacramento Valley, and crossing the mountains, struck on what was apparently the South Fork of the Trinity. This he followed down to its junction with the Klamath, and to the mouth of the latter; thence pursuing his route up the coast to Rogue's River, and the Umpqua, and over into the Willamette Valley. Supposing Rogue's River, or the Too-too-tutins, to be the one which headed in Klamath lake, he so represented it on his map; and to the Klamath he gave the name of Smith's River, by which it is yet called upon all the English sea-charts.

Smith's map, it is believed, was recently purchased in Oregon by the Joint Commission of Army and Navy Officers, and is probably now in Washington.

The name of 'Smith's River,' which as a matter of tradition, has been bandied from pillar to

post, shifting from Eel to Rogue's River, has recently vibrated between a stream running into Pelican Bay, and another, called by some Illinois River, and supposed to be the South Fork of Rogue's River."

Thus it would appear that Smith left a map on which he gave to the Klamath River the name of Smith's River, not being aware at the time that it was the outlet of the river known at its source in southern Oregon as the Klamath. After the discovering of the real outlet of the Klamath the name of Smith's River was evidently transferred to the next major stream to the north.

Unfortunately Smith's map appears to have been lost as it has never been found in the archives at Washington.

Grade Crossing Costs Formally Allocated

Authority has been granted by the Railroad Commission to California Highway Commission to construct the relocated state highway between Truckee and Tahoe City at grade across the Tahoe Branch of Southern Pacific Company at Tahoe City and to construct the highway under the main line track of that company at a point near Truckee, Nevada County, and over the tracks of the Tahoe branch at separated grades at a point about five miles north of Tahoe City. The Commission ordered the State Highway Commission to pay 70 per cent of the cost of the proposed undergrade crossing and Southern Pacific Company to pay 30 per cent, and ordered Southern Pacific Company to pay \$10,000 toward cost of the proposed overhead crossing. The Commission also ordered the Highway Commission to pay the entire cost of constructing four grade crossings at Tahoe City, which shall be protected by automatic flagmen, but Southern Pacific Company was directed to pay the cost of maintaining said flagmen or wigwag signals, after their installation.

1927 Auto Registrations

Four states in the Union last year showed a loss in registrations. The greatest decrease was indicated in Florida with 10.4 per cent less registrations than in 1926. The greatest gain of any section was in the District of Columbia with 17.5 per cent. The average increase throughout the country was 5.9 per cent and California was slightly under this with 5.5 per cent.

The total registration for the nation last year was 23,579,002, which is said to be some 80 per cent of all the motor vehicles in the world.

California leads the country in density of auto population with approximately two cars to the family. The Nation's ratio is one car to the family and there are 7.9 cars per square mile of country.

NEW CONSTRUCTION PROBLEMS

(Continued from page 9.)

The construction of desert roads has been successfully solved by paying attention to the elevations of the road in relation to the desert surface, providing proper width, analyzing the grading of the materials available for surfacing and lastly, by the use of a mixture of oil and road materials which has given a sound, high speed road entirely satisfactory as a temporary expedient. Provision for protection against cloud-bursts is an important matter.

GRADING

Studies are continually being carried on to increase the efficiency of grading operations both in cuts and fills. A very definite attempt is being made to train resident engineers to an appreciation of the slopes which are necessary to use in cuts of different heights and of different kinds of material. The construction of fills is receiving more attention, and on any fills where it is practical to do so, the material is brought up in lifts and consolidated by tamping rollers. Drainage structures, especially culverts, have been the subject of an extensive study during the past three years, not only as to the type of culverts which are in use but also as to their design. It is believed that the studies have brought out many points of installation which should be given a great deal more attention. It is very important, for instance, that all culverts should be installed so that complete drainage will occur at the end of any period of flow due to rainfall. Also, great attention must be paid to the foundations where reinforced concrete culverts are installed. It seems desirable that such culverts should be constructed in sections instead of monolithic throughout, as has been the common practice.

Metal culverts have shown a rather surprising record of usefulness.

MACADAM

The construction of bituminous macadam has never been extensively used in state work on original construction, but as a reconstruction and repair material it has always occupied an important position.

The recent introduction of emulsified asphalts in this state has led to a revival of interest in the possibility of using bituminous macadam for the salvaging of old waterbound or gravel roads. It is quite likely that this method of construction will be the next step in preservation of the large mileage of oil roads constructed by the oil mix method.

ASPHALT CONCRETE

The advance in this type of construction has been along the lines of providing a nonskid surface, a surface which would not become rough with traffic, a surface which is smoother than has heretofore been laid, and a construction which could be produced at a less cost than has heretofore been necessary. Through changing the mixture by which the amount of asphalt has been greatly decreased, the amount of fine material or filler greatly increased and the type of surface changed, a surface which is nonskid for a considerable time has been obtained. It is thought that stability has also been somewhat increased due to the high dust content of our present roads.

The state has interested itself in the perfection of a finishing machine for spreading, raking and finishing

this type of surface, and the results have been extremely successful. Not only are the roads much smoother than it is possible to obtain through hand work, but there has been a great saving in material due to truer cross-sections and a decrease in cost of laying due to the almost unlimited capacity of the machine to handle the material brought to it. Formerly, the spreading operations were limited by the number of men who could be handled on a narrow stretch of road, whereas now it is simply a question of handling the transportation that brings the material to the road.

PORTLAND CEMENT CONCRETE

Concrete pavements are under constant study to standardize and increase the efficiency of the methods used in their construction. There has been no change within the last two years in the methods of handling concrete, but we have made some change in our methods of handling steel.

Our standard practice at the present time is to place 2½-inch bars on the margin of our slabs which are constructed 10 feet in width and divided at intervals of 60 feet by an expansion joint made of cork and asphalt. At intervals of 20 feet, dummy joints are constructed across the pavement to localize cracking. Dowels are used across all expansion joints and transverse reinforcement at the end of each 60-foot panel. The state uses what is known as the standard Illinois section of 6-inch thickness at the center and 9-inch thickness at the edge. This type of construction has enabled us to secure concrete pavements practically free from corner breaks. We have also largely overcome the tendency of pavements to crack between joints.

Examination of the pavement constructed at Oxnard, in which experimental lengths of slab were laid to determine the proper length to prevent cracks, showed the following results at one year:

2 panels 60' length,	5 cracks, 100% cracked
466 panels 50' length, 112 cracks,	20% cracked
476 panels 25' length, 6 cracks,	1% cracked
744 panels 20' length 0 cracks,	0 cracked

We have made numerous experiments with different types of processes designed to increase the efficiency of concrete pavements.

We have used Celite to increase the fluidity of concrete; we have used calcium chloride to supplant water curing where water is scarce and also to increase early strength where necessity demands an early opening; we have used the Hunt process of curing by coating with a water-proofing surface of Trinidad asphalt; we have experimented with the Monolite process by placing the concrete on a water-proofing layer of tar paper to secure curing through the use of the water originally introduced in the mixing process. We have used and probably will use in the future, numerous other processes and methods which the proponents claim will be advantageous to various types of construction.

We feel that it is our duty to be informed first hand on all improvements or alleged improvements in construction methods. So far, we have found a number of these methods have a useful place in construction, but that their general adoption is entirely unnecessary on our work.

PERSONNEL

Training of the personnel to handle the construction work is a matter which requires considerable attention. Our resident engineers and their assistants are obtained through the Civil Service but we make it

our business to supervise the placing of men who seem destined to rise in the organization.

For some time we have, in periods of stress, placed men on jobs in what we call "student positions;" that is, they may have been men engaged in other kinds of engineering work but are placed under the direction of an experienced resident engineer for a short time to learn some particular branch of the work before being assigned as a more or less independent assistant.

All the work of the Construction Department is covered by the Construction Manual which is practically a textbook for the resident and assistant resident engineers. After they become thoroughly familiar with the details of the work as outlined in the specifications of the manual, this, with their practical education in the field, enables them to do satisfactory work. In many lines of work we have been able to set up a standard of competition by which men would be able to judge themselves in comparison with other men engaged on similar work, and this has stimulated a most healthy spirit among the field employees. They are made to realize that they are being watched from headquarters and that those who show particular fitness will be advanced as rapidly as conditions permit. They are constantly urged to increase their knowledge by study and by the observation of whatever work may come up in their district. We often send them from one district to another to observe a new operation so that the construction methods in various parts of the state may be as uniform as possible. A rather unusual condition is the fact that men with college training have not in the past been particularly attracted to highway work. It is hoped in the future to make this class of work more attractive to the college-trained men, as it is my belief that they are capable on the average of advancing further than those not so trained.

We have many noncollege men in the organization who have shown exceptional ability. However, it is my opinion that with proper coordination of the college work with the practical experience in highway construction, a field of endeavor is opened to college men which will be better for the highways and for the engineering profession in general.

District Engineer

Given High Honor

Colonel Jno. H. Skeggs, District Engineer, San Francisco District, was recently honored by being elected a National Director of The Society of American Military Engineers, for a three-year term beginning January, 16, 1928.

The officers of the association are, president, Brigadier General Chas. G. Dawes; vice president, Colonel Lytle Brown; secretary, Captain L. R. Lohr, all residents of Washington, D. C.

Nevada is launched on a program of highway construction for 1928 which calls for the expenditure of \$1,701,088. This sum includes Federal aid funds, county funds, state motor vehicle fees and a portion of a state bond issue. The highway development program includes the building of 100 miles of new highway and the reconstruction of an equal amount of existing roadway.

SANTA ANA RIVER BANK PROTECTION WORK

(Continued from page 10.)

wear is the greatest. The upper width of fencing came to within 18 inches of the top of the posts and extended 4 inches below the ground surface, while the lower width of fencing extended 42 inches below the ground surface.

One 58-inch width of Ellwood Type "I" fencing was fastened along the back row of posts and extended 10 inches below the ground surface, with 4 feet above the surface. This type of fencing has a 2-inch mesh and is woven with two-strand No. 12½ cables and No. 14 cross wires. The fencing was stretched tight and securely fastened to the pipe posts with tie wire.

When all fence wire was in place, the 6-foot space between the two parallel lines of fence was filled with brush, walnut tree limbs and rock to weight it down.

At the upstream end of the 2000 lineal feet of protection work, two wings each 50 feet long and constructed at an angle to the 2000-foot line ran back into the river bank and into a grove of eucalyptus trees. The wings were constructed the same as the main line of protection work, one being placed at the end of the protection work and the second 80 feet back from the end.

The cost of constructing the bank protection work per lineal foot is as follows:

Labor (equipment, supplies, etc.)—	
Setting posts and braces-----	\$0.546
Stretching fence fabric-----	0.099
Cutting brush, hauling and placing-----	0.412
Excavate to let fabric into ground and remove trash and old concrete encountered -----	0.328
Materials—	
3½-inch O.D. galv. posts and braces on job--	2.124
Fence fabric, delivered to job-----	0.353
Tie wire-----	0.004
Bolts-----	0.037
Total cost per lineal foot-----	\$3.903

The average cost of driving the 712 posts 13 or more feet into the ground was \$1.44 each, while the average cost of fitting and bolting the braces in place was 22 cents each.

Powderman Killed

On Tuesday, April 24th, Joseph Watson was killed by explosion of blasting material at a point on the Kern River Highway about 40 miles east of Bakersfield. This regrettable accident occurred through Mr. Watson's efforts to save the store of powder which was menaced by a brush fire which had gotten beyond control. He was employed as powderman with a gang engaged in widening the state highway in this location.

Picturesque Desert Highway Employee is Killed in Accident

Acquaintances and friends of William A. (Bill) Magee will learn with sorrow of his death near his beloved Sand Hills on the Yuma road. His death occurred on April 22d as a result of an automobile accident which occurred while he was driving to Holtville.

Bill has no known relatives, but his genial patience and rough and ready ways made many friends for him among the traveling public. For seven years he drove a team of horses that helped clear the sand



"Bill" Magee at work.

from the old plank road and towed cars back on the planks when they wobbled off.

His motoring friends will remember him as the stalwart highway employee who stood 6 feet 2 inches in height. Bill never wore a hat. He faced the desert sand storms and blazing sun bareheaded. His hair stood vertical on his head and his complexion was that of tanned leather.

With the completion of the fine wide pavement across the Sand Hills in 1927, his responsibilities were lessened, but he was still the same picturesque figure working along the road. The drifting sand will soon cover every physical trace of Bill's work, but he has left a more lasting and permanent mark in the memory of the motorists he helped.

Granted Time Extension

California Highway Commission has been granted an extension of time by the Railroad Commission until June 25, 1928, in which to construct two state highway crossings under the tracks of the Atchison, Topeka and Santa Fe Railway Company at Serra, Orange County.

Two highway planning commissions, one to lay out systems for metropolitan areas, the other for planning rural systems, were advocated by the Secretary of Agriculture, W. M. Jardine, in an address, before the National Automobile Chamber of Commerce in New York City.

Watching through clear plate glass with both the naked eye and the photographic camera, the Bureau of Standards is experimenting with a specially constructed apparatus to determine how and why the treads of automobile tires wear and the effect of axle-load and air pressures.

Average Gasoline Tax in Nation is 3.23 Cents Gallon

Taxes per gallon on gasoline in force January 1, 1928, are outlined in the February issue of *Vermont Progress* as follows:

Amount per gallon; states; number of states.

Five cents—Arkansas, Florida, Kentucky, New Mexico, South Carolina—five states.

Four and one-half cents—Virginia—one state.

Four cents—Alabama, Arizona, Georgia, Idaho, Maine, Maryland, Mississippi, Nevada, New Hampshire, North Carolina, South Dakota, West Virginia—twelve states.

Three and one-half cents—Utah—one state.

Three cents—California, Colorado, Delaware, Indiana, Iowa, Michigan, Montana, Ohio, Oklahoma, Oregon, Pennsylvania, Tennessee, Vermont, Wyoming—fourteen states.

Two cents—Connecticut, Illinois, Kansas, Louisiana, Minnesota, Missouri, Nebraska, New Jersey, North Dakota, Rhode Island, Texas, Washington, Wisconsin, District of Columbia—thirteen states and the District of Columbia.

Average tax in force in forty-six states, 3.2391 cents.

HOW FAST DO YOU GO?

Here is the distance you travel every second when you are doing the following number of miles per hour:

Miles per hour	Feet per second	Miles per hour	Feet per second
10-----	14.66	35-----	51.33
15-----	22.00	40-----	58.66
20-----	29.33	45-----	66.00
25-----	36.66	50-----	73.33
30-----	44.00		

Sixty-six feet per second—that is the distance you are traveling every second if you are doing forty-five miles.

That is exactly the distance across the road from fence to fence.

If you have brakes on two wheels only you can't expect to stop, according to the best records, short of 187 feet—three times the distance across the road.

If you have four-wheel brakes you may be able to stop in 124 feet—twice the distance across the road.

COLORADO—The famous 18-mile highway scaling the summit of Pike's Peak has been decided to the U. S. Government by the toll company owning it, with permission to continue private collection of tolls until 1935.

State Highway Work in the Counties

ALAMEDA COUNTY

The work of grading and reconstructing the state highway through Dublin Canyon between Dublin and Hayward is of much interest to San Francisco and East Bay people.

Contractors Ariss Knapp Co. of Oakland have been at work on this section of state highway since last fall and have made steady rate of progress, weather conditions permitting.

A visit to the work today will show that a considerable portion of the grading has been completed, especially the Castro Valley Hill and the Bulmer Hill. These two particular sections were graded and rocked early last winter in order that the road may be kept open to one-way or eastbound traffic. The contractors are at present grading a large line change in the vicinity of Palomares School and at points near Canyon Inn. Considerable effort is now being made toward placing the rock surfacing, especially on the east end in the vicinity of Dublin where it is planned that the contractor shall complete the entire road for traffic and work westerly as fast as possible.

Contractor E. B. Skeels is making rapid progress on the three bridges within this section of road. The Hollis Creek Bridge is completed and backfill is now under way. The structures at Palomares Creek near Canyon Inn and across Cull Creek near Hayward are rapidly nearing completion after which it will be possible to complete the heavy grading work over these channels.

The Allied Contractors, Inc. of Omaha have completed their contract for reconstructing 4.36 miles of state highway from Warm Springs Junction to Milpitas. The work consisted of widening the old state highway with 11 foot by 7 inches Portland cement concrete shoulder along the easterly side and resurfacing the old pavement with asphaltic concrete with an average of 2½ inches thick at the center line. The total width of reconstructed pavement is 29 feet. A small portion of the old road near Milpitas was resurfaced with 1½ inches asphaltic concrete only as it lies in that portion of the highway where it is planned to make a grade separation with the Southern Pacific and Western Pacific Railroad tracks, which improvement it is hoped can be made in the next biennium. The reconstruction is drawing much favorable comment from the traveling public as it is now the first section of widened state highway constructed between Oakland and San Jose and is a part of a program of widening which will be carried out in the future as traffic requires. This section of state highway also was of much interest to engineers and contractors as the Allied Contractors used a mechanical finisher in placing the asphaltic concrete surface and much experimenting was done in using this type of machine as a means of obtaining a higher type of asphaltic surface. The mechanical finisher for asphaltic concrete surface will in the future play an important part in this type of pavement. It has many points in its favor, especially the regulation of quantities to a minimum of over-run and obtaining a smoother wearing surface over the hand finishing method.

BUTTE COUNTY

Work is under way for the grading and graveling of 6.7 miles of road between Butte Creek and the Cherokee Canal on the Willows-Oroville lateral. The present roadway is adobe soil, having never been graveled, and in its present condition is impassable during the wet season and dusty and rutty during the summer months. The improvement of this portion of the road will complete the link between the west and east side highways. The grading is being done by state forces, the gravel surfacing to be followed by contract work later in the year.

COLUSA COUNTY

A contract was let on April 14, 1928, to E. F. Hilliard for oil processing on 5½ miles of road in Colusa County, Freshwater Creek to Williams. The contract provides for scarifying the existing road metal and for the application of 1920 barrels of fuel oil.

CONTRA COSTA COUNTY

Tieslau Bros. have completed the grading and surfacing of approaches to Wildcat Creek Bridge near Richmond in the state highway between Oakland and the Carquinez Bridge. This short stretch of state highway has made a marked improvement in alignment as it obviated two sharp curves in the old road.

DEL NORTE COUNTY

From south county line to about 3½ miles north. J. E. Johnston, contractor, has been constructing culverts, clearing and grubbing and has commenced grading work with two steam shovels now in operation.

Between Klamath River and Wilson Creek. Right of way purchases have been arranged for contracting grading and surfacing of this section of the Redwood Highway. Bids are to be opened April 18th.

Between Wilson Creek and Crescent City, work of widening highway at sharp turns is progressing satisfactorily and is money well spent.

H. W. Webber Construction Company, were awarded the contract for surfacing this section of highway and have started work.

Contract for construction of Smith River bridge on Redwood Highway will be let during April.

Bids for surfacing and oiling the Redwood Highway from the Oregon line southerly 35 miles, are to be opened April 18th.

EL DORADO COUNTY

The construction of 0.49 mile of graded roadbed, between Shingle Springs and El Dorado was begun March 14, and is well under way. Nate Lovelace is the contractor.

Location surveys are under way for work proposed through the upper American River Canyon, between Strawberry and Riverton.

FRESNO COUNTY

Several bridges have been built on the old road west of Coalinga on the Sierra-to-the-Sea Lateral. Mostly on the locations where old fords existed, which were impassable during floods. Widening and straightening is also progressing satisfactorily under Foreman O. D. Gaston and considerable favorable comment is being received concerning the improvements.

A reconnaissance survey of the Kings River Canyon in Fresno County is being made by S. A. Cobb.

GLENN COUNTY

Construction work is now under way for improving 6.2 miles of road between Orland and Hamilton City. The work consists of placing corrugated metal pipe culverts, and constructing one concrete box culvert, widening and raising the grade and placing standard road surfacing mixed with oil. The furnishing and delivering of unscreened gravel is under contract to L. G. Kipp, and the furnishing and delivering of standard road surfacing is under contract to Force, Currihan & McLeod. The placing of the culverts and finishing of the road surface will be done by state forces.

The road under improvement is a part of the lateral connecting with Route 3 at Chico and Route 7 at Orland, commonly known as the Chico-Orland lateral.

HUMBOLDT COUNTY

On the Hauser contract between Orick and the county line work has been resumed, clearing up slides caused by winter rains. One shovel is being operated.

On Engelhart's contract small culvert work has practically been completed and contractor is preparing to resume grading and surfacing operations.

The contract for the construction of reinforced concrete bridges across Prairie and Lost Man creeks near Orick was awarded to E. B. Skeel of Roseville, California.

INYO COUNTY

The contract for grading on new alignment of the road from Coso Junction to Olancho, has just been completed and though as yet unsurfaced, has brought forth many favorable comments. The new road is practically straight and 24 to 30 feet wide, whereas, the old road was a series of kinks with undulating grades conforming to the country and was very indirect and narrow.

During June, bids will be received for grading and oil-treated surfacing from Diaz Lake, three miles south of Lone Pine to Alabama Gate, about 5.5 miles north of Lone Pine. Bids will also be received about the same time for surfacing with oil treatment that portion of the main Owens Valley road from Tinemaha Dam to a point two miles south of Big Pine, a distance of about seven miles.

During the summer about 33 miles of the main highway will be oil-treated by state forces which when completed will give, with the mileage in the above contracts, an oiled surface from the top of Sherwin Hill, in Mono County, to Diaz Lake, a distance of about 84 miles. This improvement will be welcomed by the local residents and tourists as it will eliminate the very trying dust nuisance and corrugated road surface encountered in the past during the heavy summer travel.

Request for funds has been approved for widening and alignment improvements between Big Pine and Oasis, a much needed improvement in lieu of a relocation, which is of expensive construction and not warranted for many years to come.

Preparations are being made for additional office space at the District Headquarters, occasioned by organization expansion.

IMPERIAL COUNTY

The Jahn and Bressi Construction Company have started work on their new contract on the San Diego-El Centro highway between El Centro and Seeley. The work will consist of correcting bad drainage conditions, and widening and resurfacing the existing pavement. The contract time will not expire until January 12, 1929 thus allowing sufficient time for the contractors to lay the asphaltic pavement during the cooler season.

KERN COUNTY

The state forces have just completed the grading of portions of the Walker Pass road from Weldon to the summit of the Walker Pass. Widening and alignment changes and the installation of culverts now makes this road a comparatively easy and fast entrance to the Owens Valley from points in the vicinity of Bakersfield and, during the time when the northern passes are closed by snow, from points north of that town. Especially will this be so, when the section on the east side of the summit will be graded on new alignment to a connection with the main highway near Freeman, which work has been started by state forces.

A new approach from the north on the main highway leading into Mojave, will soon be surveyed and when completed will provide a much better entrance and will permit the building of the Mojave maintenance yard which the present highway crosses.

An additional allotment has been provided to continue the work of widening, being done in the Kern River Canyon. A power shovel and outfit is making much-needed improvements on the old county road.

A good deal of favorable comment is being received on the work being done by day labor on Route 10, west of Coalinga, the Sierra-to-the-Sea lateral. The road is being widened, curves eliminated, and bridges built.

Work in the Kern River Canyon is in progress by state forces. The road is being straightened and widened and the drainage system perfected.

LAKE AND COLUSA COUNTIES

Approximately 42½ miles of location surveys were recently completed between Upper Lake in Lake County, and Williams in Colusa County. The road located will, when completed, provide an outlet to the Sacramento Valley and to San Francisco for the rapidly increasing summer population in the vicinity of Upper Lake and along the east shore of Clear Lake. Plans and estimates in connection with this work are about 75 per cent complete.

LAKE COUNTY

The maintenance forces of District IV have done wonderful service to Lake County in widening and daylighting the existing traveled road from the Napa County line toward Middletown. What previously was a one-way road is now widened to a two-way highway. Many of the sharp points have been removed, curves have been daylighted to permit of longer vision and a portion of the road surfaced with local material. In addition to the grading work two dangerous bridges across St. Helena Creek have been replaced by timber deck trestles of ample width to care for the heavy trucking and vehicular traffic over Route 49.

LOS ANGELES COUNTY

Work is now under way on the reconstruction of Foothill Boulevard between Monrovia and Azusa. All buildings, irrigation lines, poles and pipe lines have been moved in accordance with the plans for the new highway which provides for a 40-foot asphaltic concrete pavement with 8-foot bituminous macadam shoulders.

Placing of oil treated crushed stone surfacing on a 12-mile stretch of the Coast Highway through the Malibu Ranch is now well under way. All grading work on this job has been completed.

The construction of a 21-mile pipe line along the coast from Los Angeles city limits to Nicolas Creek on the Malibu Ranch has been completed. This line will furnish water to be used in connection with highway construction and maintenance.

MADERA COUNTY

The Callahan Construction Co. are grading and setting up an asphalt plant for the resurfacing of a 6-mile section of Route 4, south of Madera, between Herndon and Arcola School. P. L. Wilcox is Resident Engineer.

The Carl Peterson Company of Fresno were low bidders for the construction of a bridge at Herndon over the San Joaquin River on the new location on the west side of the Southern Pacific tracks.

MARIN COUNTY

Bids are now being advertised, to be received May 23d, for reconstructing a portion of the existing state highway from Ignacio to Gallinas Creek, about 1½ miles north of the city line of San Rafael. Ignacio is the junction of state highway routes I and VIII. The traffic between Ignacio and San Rafael is very heavy it being the only through road available for traffic in this section of Marin County.

The new improvement will provide a 20-foot second-story Portland cement concrete pavement with rock borders and a widened graded roadway.

The portion from Gallinas Creek to San Rafael, upon which plans are now under preparation, will be advertised for bids during the coming summer in order that this work may be continuous and the entire state highway completed between San Rafael and Ignacio during the present year.

MARIPOSA COUNTY

The work of widening and straightening on the Yosemite All-year Highway by the convict crew, has received an added impulse by the purchase of a Diesel-powered shovel. Hairpin turns are rapidly being eliminated on this heavily traveled recreational road.

A new shovel powered with a Diesel engine has been purchased by the Equipment Department to continue the work of widening and line changing on the Yosemite All-year Highway. This will be assigned to the convict camp in charge of W. B. Albertson.

MERCED COUNTY

Contractor H. C. Whitty is making good progress in widening all of the old narrow bridges on the Golden State Highway through Merced County.

The multiple box culvert recently installed on the Pacheco Pass Lateral functioned during the spring floods as evidenced by the attached picture and considerable damage to roadbed, as has occurred in the past, was avoided.

The contract for resurfacing 6.5 miles of Route 4, Tharsa to Arcola School, has been awarded to the Callahan Construction Company of Los Angeles. Construction work is to be started at once. P. L. Wilcox is to be resident engineer on the job.

MONO COUNTY

The roads in Mono County for the first time in several years have been traversable all winter, due to the comparatively light snowfall. Maintenance crews are now established in their summer camps and the main road to Bridgeport and Coleville from Bishop has been placed in good condition for the summer travel which is starting already.

A contract for the grading of portions of the main road from Dogtown to Point Ranch, located about five miles south of Bridgeport will probably be advertised early this month.

As soon as the receding snows will permit, maintenance crews will open up the Tioga and Sonora Pass

roads to travel and considerable betterment work will then be done to make these roads safer for travel.

Two narrow crossings of Rock Creek on the main road will be widened this summer from 16 feet to 30 feet.

The Sherwin Hill Grade, at the southerly end of the main road, has been resurfaced, and will be oiled before the heavy summer travel begins, which should relieve considerably the long strenuous pull up this four-mile grade.

MONTEREY COUNTY

Preparation for the beginning of convict construction on the Carmel to San Simeon highway is practically completed. A large camp has been constructed just north of Salmon Creek and the first convicts are expected to arrive at the camp early in April.

In preparation for this construction a new survey has been run extending for a distance of 7.5 miles northerly from Salmon Creek, terminus of the present constructed highway near the southerly boundary of Monterey County.

A contract has been let to Theo. M. Maino for the construction of a timber bridge across Salmon Creek. This bridge will form a portion of the completed highway, and will permit easier access both to the camp and to the entire new construction work than is possible by the present method of fording the stream.

The various portions of the San Lucas to Coalinga lateral have been constructed to state highway standards either by the state or by the counties concerned, except for the Mustang Grade which crosses the high ridge separating Peach Tree Valley from Priest Valley. State forces are now commencing work on the improvement of this grade. This work will include the widening of the roadbed to make it safe for two lines of traffic throughout, and the placing of sufficient surfacing to make it possible to travel the road at all times of year.

Contractor Charles W. Wimmer has recently completed the reconstruction of 1.9 miles of road immediately north of Salinas, extending from the northerly city limits to Santa Rita road. This has been graded to a wide section and paved with Portland cement concrete.

A location survey party is at work projecting a new location for a portion of the highway between Carmel and Big Sur which will eliminate the long climb that the present county road makes over Sierra Hill, north of the Little Sur River. The construction of the road now being located will serve to make the Big Sur country much more easily accessible.

NAPA COUNTY

The Mt. St. Helena road or that portion of Route 49 one mile north of Calistoga to the Lake County line, is being dragged and worked over preparatory to placing an oil surface on this scenic mountain highway. District IV maintenance department has a large oiling program to carry through during the present spring and early summer at which time it is planned to oil treat the surface of practically all our water-bound broken stone roads.

ORANGE COUNTY

Construction of the link which will connect the Coast Highway through Huntington Beach and Laguna with the Los Angeles to San Diego Highway at Serra is almost complete. Grading work, culverts and two new under grade crossings of Santa Fe Railroad have been completed. The placing of the concrete pavement, and the slope paving adjacent to the under pass crossings is in progress.

Work is in progress by a maintenance crew on the enlarging by deepening and extension, of a large concrete box culvert near Irvine. Traffic will continue to use the highway while the work is in progress.

PLACER COUNTY

The work of crushing and stockpiling of material between Baxters and Shelter House Number 1, which was suspended during the winter months, has been resumed and will be completed at an early date.

Preliminary surveys are under way for a re-routing of Route 37 along the Bear River.

RIVERSIDE COUNTY

The Maintenance Department has recently installed a set of truck scales along the Los Angeles-Imperial Valley highway about a mile east of Banning. This work was done in response to a request by the Division of Motor Vehicles wherein it was pointed out that there were not sufficient weighing facilities for efficient patrol of the highway. Until the present time, there were no scales between the San Bernardino-Riverside County line and Indio. This road carries a great deal of heavy trucking between Imperial Valley and Los Angeles. The public as well as a large majority of the trucking companies will welcome enforcement of the legal weight limits along this highway. Prevention of the ruinous and destructive effect of improper heavy loads will prolong the usefulness of the pavement and the saving in meantime will help finance widening and other improvement.

SACRAMENTO AND PLACER COUNTIES

The contract for constructing 3.1 miles of graded roadbed and asphalt concrete pavement on the reconstruction work between Sylvan School and Roseville was completed March 19, 1928. J. C. Compton was the contractor.

SAN BERNARDINO COUNTY

Foothill Boulevard. The first reconstruction project on the Foothill Boulevard has advanced well toward completion. The existing 18-foot cement concrete pavement has been widened and resurfaced with asphaltic concrete and the contractor's operations are now confined to miscellaneous grading and shoulder work. The work has been conducted with the least possible interruption to traffic. The highway has been closed only during working hours and for the shortest possible distance at a time.

This project covers the first 9.3 miles west from San Bernardino. Preparations are being made to let a second contract to extend the improvement to the San Bernardino-Los Angeles County line.

Redlands to the Riverside County Line. The reconstruction of 4.8 miles of the Los Angeles-Imperial Valley highway is almost complete. The existing pavement consisted of approximately one mile of 16-foot Portland cement concrete and 3.8 miles of oiled macadam. Under the present project the existing cement concrete pavement has been redecked and the oiled macadam surfacing has been torn up and replaced with new Portland cement concrete pavement 20 feet wide. The contractor is now constructing macadam borders using material salvaged from the old macadam surfacing. Several line and grade changes were made and the curves were superelevated, thereby improving the road to meet present day standards.

SAN DIEGO COUNTY

Excellent progress is being made on the reconstruction of 2 miles of highway between Pine Valley and Buckman Springs. The present roadway is being widened and realigned. A new bridge over Cottonwood Creek is under construction.

The reconstruction of the state highway between La Mesa and the east city limits of San Diego is nearing completion. Grading and culvert work has been completed and the placing of the asphaltic concrete surface is in progress. The cost of the work all of which is under state inspection will be shared by the county and the state.

SAN JOAQUIN COUNTY

On account of the dry season, District Six is making preparations to start at once on an extensive oiling program throughout the San Joaquin Valley.

SAN LUIS OBISPO COUNTY

A contract has recently been awarded to Mr. J. F. Collins for the construction of a line change two miles north of San Luis Obispo, which change will eliminate three sharp curves and constitute a splendid improvement in the line and grade of this portion of the road. The construction will involve a major change in the channel of San Luis Obispo Creek.

The reconstruction of the highway from Pismo to San Luis Obispo, J. F. Knapp, contractor, has progressed to the point where the majority of the rough grading is now completed, and paving operations are about to start. It is planned to divert northbound traffic over county roads from Pismo to San Luis Obispo by way of Edna during paving operations. The diverting of this one line of traffic, combined with the fact that the contractor has planned to use an industrial railway for the hauling of his aggregates, will result in very little inconvenience to traffic during the paving operations.

A new camp is being constructed for the California National Guard about four miles northwest of San Luis Obispo and the Division of Highways has just let a contract for the construction of 1.6 miles of road within the camp area.

A maintenance foreman's cottage is being constructed at Shandon where the maintenance station is located for maintaining the easterly portion of the Cholame lateral in San Luis Obispo County.

SAN MATEO COUNTY

Contractors Granfield, Farrar and Carlin are making good progress on their contract covering grading and the placing of a waterbound broken stone surface on that portion of the Bayshore Highway from South San Francisco underpass to Broadway, Burlingame. The work consists of bringing to subgrade the existing roadway surface over a total width of 60 feet and the placing of a 40-foot crushed stone surface 8 inches in thickness. The work is progressing satisfactorily, there being about one-half mile of rock to be placed at the southerly end near Broadway, Burlingame.

That portion of the road from South San Francisco to the San Francisco Airport at Mills Station has been completed. The roadway surface was treated with two applications of asphaltic oil and screenings by the maintenance forces of the district. The heavy traffic to the airport is utilizing this completed portion and very favorable comment is heard due to the completion of this road which has been in the public eye for a number of years.

Bids were received on April 25th for constructing a new portion of the Bayshore Highway from Broadway to Fifth street, San Mateo. The low bid submitted was received from C. W. Wood of Manteca in amount of \$133,370.

The work will consist of grading a 60-foot roadway and placing thereon a 40-foot by 8 inches waterbound crushed stone surface. This three-mile section is a most important link in the Bayshore Highway as its completion will permit of through traffic from San Francisco to San Mateo over a new route and will materially aid traffic; especially on holidays and Sundays when the Peninsula Highway is overtaxed. It is expected the contract will be awarded early this month to permit of summer construction work.

SAN MATEO, SANTA CLARA AND SANTA CRUZ COUNTIES

A contract was recently awarded by the Director of Public Works to Twohy Bros. and J. F. Shea of Oakland for constructing a portion of the Skyline Boulevard from La Honda Summit to Saratoga Gap, a distance of 13.8 miles.

Twohy Bros., bid for this work was \$652,238.

The work to be done will be the heaviest grading work yet encountered on the Skyline Boulevard involving over 900,000 cubic yards of excavation. Upon the completed roadway will be placed a 20-foot by 8 inches waterbound crushed stone surface. This important section of the Skyline Boulevard is a connecting link as its completion will permit of through traffic between San Francisco and Santa Cruz via Boulder Creek. To date but 33 miles have been constructed and opened to traffic between San Francisco and La Honda Summit and is used only by local traffic to La Honda.

From a scenic standpoint the completion of this road will offer to the traveling public one of the most beautiful highways in California. The completed road will wind through virgin redwood forests and along the crest of the San Mateo Mountains from which wonderful views may be obtained of the Pacific Ocean and the San Francisco bay region.

There remains approximately 14 miles of the Skyline Boulevard upon which no construction has commenced. This portion lies along the Castle Gate Ridge from Sanatoga Gap to Schultheis Pass at Woodwardia at a junction with the paved state highway from Los Gatos to Santa Cruz.

SANTA BARBARA COUNTY

The Santa Maria River, which crosses the highway just north of the city of Santa Maria, has been the cause of considerable bridge work at various times owing to the large volume of water carried by it during flood and its ability to change its channel. The Bridge Department completed last year the construction of a concrete bridge to replace the wooden trestle which was constructed in 1914 across the new channel formed by the stream at that time. The older channel is still spanned by a steel bridge, the wooden approaches to which have been rapidly deteriorating. Work is just being completed on replacing the northerly approach by an embankment surfaced for the present with waterbound macadam and protected with concrete slope paving.

Contractor J. F. Collins is just completing the construction of 24 miles of rock borders along the highway through the northerly part of Santa Barbara County extending from Orcutt to Zaca.

TULARE COUNTY

State forces now have two outfits oiling shoulders along the Golden State Highway in Tulare County.

Automobile fatalities for the 52 weeks ending December 3d totaled 6969, according to figures just announced by the U. S. Census Bureau. This is an increase of three per cent over the 52-week period last year when 6658 persons were killed by automobiles. Figures compiled by the American Motorists Association show that this year there were 21.1 persons killed per 100,000, against 20.07 per 100,000 killed last year. The figures cover only the 77 largest cities in the United States.

Teacher: "Norman, give me a sentence using the word 'diadem.'"

Pupil: "People who drive onto the railroad crossing, diadem sight quicker than those who stop, look and listen."—*Georgia Motorist*.

County Figures Show Increase in Motor Vehicle Registration

The following statement shows the growth in comparative motor vehicle registration in the various counties of California for the years 1914 and 1927:

Counties	1914	1927
Alameda	8,449	125,381
Alpine	9	51
Amador	165	2,032
Butte	1,019	13,378
Calaveras	155	1,975
Colusa	425	4,384
Contra Costa	930	21,191
Del Norte	56	1,417
El Dorado	154	2,422
Fresno	4,488	56,360
Glenn	490	4,877
Humboldt	994	13,581
Imperial	1,515	19,593
Inyo	187	2,788
Kern	2,521	33,903
Kings	870	9,251
Lake	168	2,625
Lassen	181	3,830
Los Angeles	43,099	689,902
Madera	343	5,573
Marin	686	9,499
Mariposa	44	1,047
Mendocino	463	7,158
Merced	634	11,689
Modoc	136	1,743
Mono	12	344
Monterey	892	14,737
Napa	687	7,065
Nevada	169	2,919
Orange	3,761	43,660
Placer	437	8,419
Plumas	98	1,954
Riverside	2,128	27,345
Sacramento	3,419	42,925
San Benito	328	4,309
San Bernardino	3,198	40,584
San Diego	5,665	66,351
San Francisco	12,081	135,729
San Joaquin	2,500	35,366
San Luis Obispo	661	9,875
San Mateo	1,258	19,013
Santa Barbara	1,796	20,497
Santa Clara	3,941	48,885
Santa Cruz	986	13,497
Shasta	340	4,803
Sierra	64	726
Siskiyou	379	7,925
Solano	848	11,570
Sonoma	1,913	24,011
Stanislaus	1,791	23,503
Sutter	333	5,842
Tehama	428	5,154
Trinity	30	547
Tulare	2,412	28,431
Tuolumne	248	3,079
Ventura	1,410	17,727
Yolo	798	8,850
Yuba	324	4,751
Totals	123,516	1,736,765

Record of Bids and Awards

DIVISION OF HIGHWAYS

AMADOR COUNTY—East of Jackson 1.35 miles of grading. Dist. X, Rt. 34, Sec. C. Engineer's Est. \$6,493. Bids opened May 3d as follows: G. D. Contoules, San Francisco, \$7,160; G. E. Finnell, Sacramento, \$6,953.50. Contract awarded to G. E. Finnell.

COLUSA COUNTY—Between one-half mile of Freshwater Creek and Williams, 5.5 miles of existing crushed gravel surfacing to be treated with oil road mix. Dist. III, Rt. 15, Sec. E. Engineer's Est. \$6,284.63. Bids opened April 11th as follows: J. C. Compton, Roseville, \$12,015; A. Teichert & Son, Sacramento, \$6,805; J. F. Collins, Stockton, \$8,017; E. R. Hilliard, Sacramento, \$6,542.50; Geo. E. Finnell, Sacramento, \$7,050; M. J. Bevanda, Stockton, \$7,758; C. W. Wood, Stockton, \$8,250. Contract awarded to E. F. Hilliard for \$6,542.50.

DEL NORTE COUNTY—A steel cantilever bridge across Smith River about 8 miles east of Crescent City. Dist. I, Rt. 1, Sec. C. Engineer's Est., \$159,799. Bids opened April 4th as follows: R. Johnson, Glendale, \$195,815; J. J. Badrann, Portland, Oregon, \$175,534; Jas. S. Hickey, Portland, Oregon, \$179,863; Parker-Schram Co., Portland, Oregon, \$170,479; Mercer-Fraser Co., Eureka, \$206,042; Holdener Construction Co., Sacramento, \$197,173. Contract awarded to Parker-Schram Co. for \$170,479.

DEL NORTE COUNTY—Between California-Oregon line and 0.7 mile south, distance to be graded and surfaced with crushed gravel or stone. Dist. I, Rt. 1, Sec. B. Engineer's Est. \$16,357.75. Bids opened May 16th as follows: Holdener Const. Co., Sacramento, \$14,818.75; Smith Bros., Eureka, \$17,806.75; Washburn & Hall, Portland, \$15,864; J. T. Logan, Grants Pass, \$17,476.50; John R. Hill, Harbor, Ore., \$13,821. Contract awarded to John R. Hill.

DEL NORTE COUNTY—Between Crescent City and 0.7 of a mile south of the Oregon line, 21.6 miles of surfacing with crushed gravel or stone. Dist. I, Rt. 1, Sec. A-B. Engineer's Est. \$61,800. Bids opened May 16th as follows: Holdener Const. Co., Sacramento, \$46,486.10; Smith Bros., Eureka, \$71,176.80; Washburn & Hall, Portland, \$67,502.80; Wren & Greenough, Portland, \$59,897.50; J. T. Logan, Grants Pass, \$74,350; Webber Const. Co., Crescent City, \$57,219; William C. Elsemore, Eureka, \$57,790. Contract awarded to Holdener Construction Co. for \$46,486.10.

DEL NORTE COUNTY—Between Smith River and the Oregon line, 35.3 miles of surfacing with crushed gravel or stone oil treated. Dist. I, Rt. 1, Sec. C-D-E. Engineer's Est. \$169,990.50. Bids opened May 16th as follows: Holdener Const. Co., Sacramento, \$158,461.50; Kaiser Paving Co., Oakland, \$191,146; Guy F. Pyle, Eugene, Ore., \$190,875.50. Contract awarded to Holdener Const. Co.

DEL NORTE COUNTY—Between Klamath River and Wilson Creek about 7.3 miles to be graded and surfaced with crushed gravel or stone, and construction of four timber bridges. Dist. I, Rt. 1, Sec. A. Engineer's Est. \$278,281. Bids opened April 18th as follows: Holdener Const. Co., Sacramento, \$316,308; J. E. Johnston, Stockton, \$271,642; Henry J. Kaiser, Oakland, \$282,071; Wm. Von der Hellen & Co., Medford, Oregon, \$266,257; S. H. Palmer Co., San Francisco, \$288,397; Mercer-Fraser Co., Eureka, \$342,245. Contract awarded to J. E. Johnston for \$271,642.

EL DORADO COUNTY—Between Eagle Falls and Meek's Bay, 3.3 miles to be graded. Dist. III, Rt. 38, Sec. B. C. Engineer's Est. \$59,533.50. Bids opened May 2d as follows: Nate Lovelace, Oakland, \$51,551.50; Tieslau Bros., Berkeley, \$51,975.50; Holdener Const. Co., Sacramento, \$53,214.90; G. D. Contoules, San Francisco, \$35,663.30. Contract awarded to Contoules.

EL DORADO COUNTY—Between Fresh Pond and 3 mile east of Riverton, 6.2 miles in length, crushed gravel or stone to be produced and stockpiled. Dist. III, Rt. 11, Sec. F&G. Engineer's Est. \$17,500. Bids opened April 25th as follows: A. Teichert & Son, Inc., Sacramento, \$25,200; Harold Smith, St. Helena, \$16,030; Immel & Seidel, Berkeley, \$18,900; Monfort & Armstrong, Sacramento, \$18,130; C. A. Failing, Tres Pinos, \$22,400; C. W. Wood, Stockton, \$23,800; Tieslau Bros., Berkeley, \$20,580; Hemstreet & Bell, Marysville, \$21,000. Contract awarded to Harold Smith of St. Helena for \$16,030.

FRESNO AND MADERA COUNTIES—Bridge across San Joaquin River (Herndon Bridge) 1 mile north of Herndon. Dist. VI, Rt. 4, Sec. C&A. Engineer's Est. \$206,052. Bids opened April 18th as follows: Keller-Gist, Inc., Los Angeles, \$218,456; M. B. McGowan, San Francisco, \$207,959; R. E. Mieth, Portland, \$195,516; Ben C. Gerwick, Inc., San Francisco, \$222,142; Butte Const. Co., San Francisco, \$198,767; Carl H. Peterson, Fresno, \$188,734; A. W. Kitchen, San Francisco, \$218,063; Rocca & Caletti, San Francisco, \$229,617; C. E. Green & L. Worel, Los Angeles, \$218,262; Chas. F. W. Steffen, San Diego, \$198,183; Holdener Const. Co., Sacramento, \$214,136.35; J. F. Knapp, Stockton, \$207,634. Contract awarded to Carl H. Peterson of Fresno for \$188,734.

GLENN COUNTY—Through Orland, grading and Portland cement concrete paving 1.1 miles. Dist. III, Rt. 7, Sec. C. Engineer's Est. \$34,824. Bids opened May 9th as follows: M. J. Bevanda, Stockton, \$39,316; C. W. Wood, Stockton, \$36,691. Contract awarded to C. W. Wood.

HUMBOLDT AND MENDOCINO COUNTIES—Furnishing crushed gravel or stone, graded, in designated stock piles on state highway between Myers and Laytonville. Dist. I, Rt. 1, Sec. J-K. Engineer's Est. \$13,530. Bids opened May 24th as follows: Smith Bros. Co. of Eureka, \$13,860; Tieslau Bros., Berkeley, \$14,784; Wm. C. Elsemore, Eureka, \$15,510. Contract awarded to Smith Bros. Company.

INYO COUNTY—Between Diaz Lake and Alabama Gate, 8.5 miles of grading and surfacing with crushed gravel or stone, oil treated. Dist. IX, Rt. 23, Sec. L. Engineer's Est. \$87,187.20. Bids opened May 31st as follows: Tieslau Bros., Berkeley, \$84,478.50; M. Blumenkranz, Los Angeles, \$97,142.40; Nighbert-Carnahan, Bakersfield, \$93,573.60; Southwest Paving Co., Los Angeles, \$79,112.90; G. E. Finnell, Sacramento, \$80,770.30; Geo. French, Jr., Stockton, \$99,020.50. Contract awarded to Southwest Paving Company.

INYO COUNTY—Between Tinnemaha Dam and Big Pine, 6.3 miles surfaced with oil-treated crushed gravel or stone. Dist. IX, Rt. 23, Sec. B-C. Engineer's Est. \$42,120. Bids opened May 31st as follows: Tieslau Bros., Berkeley, \$42,875; M. Blumenkranz, \$47,485; Nighbert-Carnahan Co., Bakersfield, \$49,855; Harry Wilson, \$34,640; Southwest Paving Co., Los Angeles, \$37,040; Montfort & Armstrong, Sacramento, \$32,809.50; Geo. French, Jr., \$44,304. Contract awarded to Montfort & Armstrong.

LOS ANGELES COUNTY—Between Monrovia and Azusa, 3.5 miles to be graded and paved with asphalt concrete. Dist. VII, Rt. 9, Sec. G. Engineer's Est. \$189,779. Bids opened April 11th as follows: Gibbons & Reed Co., Burbank, \$150,615; Geo. H. Oswald, Los Angeles, \$165,938; George R. Curtis Paving Co., Los Angeles, \$170,821; Jahn & Bressi Const. Co., Los Angeles, \$208,292; Ed. Johnson & Sons, Los Angeles, \$170,248; Hall-Johnson Co., Alhambra, \$160,711; Griffith Co., Los Angeles, \$163,756; C. E. Osborn, Pasadena, \$154,159. Contract awarded to Gibbons & Reed for \$150,615.

LOS ANGELES COUNTY—Between Arroyo Sequit and Los Alisos Creek, 1.5 miles to be graded. Dist. VII, Rt. 60, Sec. A. Engineer's Est. \$63,791.50. Bids opened April 18th as follows: Jahn & Bressi, Los Angeles, \$53,833; Roche-Axman Co., Glendale, \$59,087; McCray Co., Los Angeles, \$66,955; S. J. Hales, Santa Ana, \$46,717; G. L. Ritchey, Los Angeles, \$58,609; Kuhn-Lang Co., Los Angeles, \$66,733; C. G. Willis & Sons, Inc., Los Angeles, \$81,944; Geo. J. Bock, Los Angeles, \$57,833; James Martin, Los Angeles, \$73,992; Sander Pearson, Los Angeles, \$63,222; Francisco & Ellington, Inc., Los Angeles, \$58,793; Matt S. Ross, Los Angeles, \$63,516; Grunwald & Tudor, Los Angeles, \$63,687; S. W. Gleim, Los Angeles, \$49,231; Geo. Mitchell Co., Huntington Park, \$70,636; John J. Dann, Portland, \$64,848; Bert Calvert, Los Angeles, \$61,512; Fred W. Nighbert, Bakersfield, \$57,332. Contract awarded to Lewis Construction Co. for \$44,652.

LOS ANGELES COUNTY—Bridge across Santa Anita Wash at Arcadia. Dist. VII, Rt. 0, Sec. E. Engineer's Est. \$34,193. Bids opened April 25th as follows: J. C. Butler, Los Angeles, \$26,601; Engstrom Const. Co., Los Angeles, \$21,669; Ross Const. Co., Los Angeles, \$24,705; Franklin B. Gridley, Pasadena, \$26,220; Paul M. White, Santa Monica, \$32,450; Byerts & Dunn, Los Angeles, \$30,000; Whipple & Secord, Los Angeles, \$24,661; H. G. Klusman, \$30,511; Geo. Mitchell, Huntington Park, \$38,892; Ignace P. Lipp, Hollywood, \$28,345; Geo. J. Ulrich Const. Co., Modesto, \$27,157; Sidney Smith, Contractor, Los Angeles, \$30,967; W. M. Ledbetter & Co., Los Angeles, \$31,216; Keller-Gist, Inc., \$26,545. Contract awarded to Whipple & Secord for \$24,661.

MARIN COUNTY—Between Ignacio and Gallinas Creek, 4.9 miles to be graded and paved with Portland cement concrete. Dist. IV, Rt. 1, Sec. A. Engineer's Est. \$241,405. Bids opened May 23d as follows: C. W. Wood, Stockton, \$237,054; Kaiser Paving Co., Oakland, \$279,718.70; J. V. Galbraith, Petaluma, \$242,062.50; Hanrahan Co., San Francisco, \$215,662. Contract awarded to Hanrahan Co.

MONTEREY COUNTY—Between the easterly boundary and Camphora, (portions) 5 miles to be surfaced with bituminous macadam. Dist. V, Rt. 2, Sec. AB&C. Engineer's Est. \$33,330. Granite Const. Co., Watsonville, \$32,643; Fred W. Nighbert, Bakersfield, \$31,940. Contract awarded to Fred W. Nighbert.

ORANGE COUNTY—From Galivan to 1 mile north, 0.9 mile grading and oil treated crushed gravel or stone surfacing. Dist. VII, Rt. 2, Sec. B. Engineer's Est. \$50,113.20. Bids opened May 16th as follows: Dimmitt & Taylor, Los Angeles, \$63,012; Bert Calvert, Los Angeles, \$44,899.50; Watson & Sutton, San Diego, \$52,553.70; Kuhn-Lang Co., Los Angeles, \$61,889.70; E. J. Davis, Venice, \$56,913.40; C. G. Willis & Sons, Inc., Los Angeles, \$63,737.90; M. Blumenkranz, Los Angeles, \$61,736; Mathews Construction Co., Sacramento, \$60,530; Jahn & Bressi, Los Angeles, \$59,352.60; Steele Finley, Santa Ana, \$53,751; George J. Bock, Los Angeles, \$52,812. Contract awarded to Bert Calvert.

PLUMAS COUNTY—Grading and surfacing 6.2 miles from western boundary to $2\frac{1}{2}$ miles southwest of Chester. Dist. II, Rt. 29, Sec. A. Engineer's Est. \$106,905.20. Bids opened May 9th as follows: C. T. Malcom, Walnut Creek, \$133,428.40; Holdener Construction Co., Sacramento, \$118,283.70; Kaiser Paving Oakland, \$120,838.25; Chas. Harlowe, Jr., Oakland, \$101,694.70; Nate Lovelace, Oakland, \$108,466.60. Contract awarded to Chas. Harlowe, Jr., \$101,694.70.

PLUMAS COUNTY—Two reinforced concrete girder bridges across Rock Creek and Bailey Creek. Dist. II, Rt. 29, Sec. A. Engineer's Est. \$13,529. Bids opened April 18th as follows: James R. Head, Chico, \$13,822; M. A. Jenkins, Sacramento, \$12,291; Holdener Const. Co., Sacramento, \$14,832; C. F. Herziger, San Francisco, \$9,986; R. B. McKenzie, Gerber, \$13,865; Coolidge & Scott, Minden, Nevada, \$13,429; J. P. Brennan, Redding, \$12,034; C. B. Glendenning, Los Molinos, \$12,304. Contract awarded to C. F. Herziger for \$9,986.

PLUMAS AND LASSEN COUNTIES—Between Chester and Devils Corral, 12.4 miles of surfacing with crushed gravel or stone. Dist. II, Rt. 29, Sec. A-B. Engineer's Est. \$38,225. Bids opened May 16th as follows: Tieslau Bros., Berkeley, \$36,903; C. A. Failing, Tres Pines, \$31,900; Montford & Armstrong, Sacramento, \$31,773; E. B. Bishop, Sacramento, \$28,825. Contract awarded to E. B. Bishop.

SACRAMENTO COUNTY—Five reinforced concrete girder bridges on line change between Galt and Arno. Dist. X, Rt. 4, Sec. A. Engineer's Est. \$50,403. Bids opened May 16th as follows: George J. Ulrich, Jr., Modesto, \$39,425.50; E. B. Skells, Roseville, \$48,837; P. F. Bender, North Sacramento, \$50,913.75; Holdener Const. Co., Sacramento, \$46,661.20; Immel & Seidel, Berkeley, \$46,349.75; Nelson Bros., Escalon, \$49,917.75; M. A. Jenkins, Sacramento, \$48,990.50; Frederickson Bros., Stockton, \$51,734.50; McDonald & Maggiora, Sausalito, \$54,873.50. Contract awarded to George J. Ulrich, Jr.

SAN BERNARDINO COUNTY—Between San Bernardino and Redlands, constructing a timber bridge across San Timoteo Creek. Dist. VIII, Rt. 26, Sec. A. Engineer's Est. \$3,079. Bids opened May 29th as follows: E. G. Perham, Los Angeles, \$3,416.42; L. Worel, Alhambra, \$3,498.05; P. W. Kranz, Los Angeles, \$5,017; R. Johnson, Glendale, \$4,036; Merce-reau Bridge & Const. Co., Los Angeles, \$3,900; Wm.

M. Ledbetter, Los Angeles, \$3,497. Contract awarded to E. G. Perham.

SAN JOAQUIN COUNTY—Removal present timber approaches and dolphins and construction of new timber approaches to drawbridge. Dist. X, Rt. 53, Sec. A. Engineer's Est. \$13,860. Bids opened May 14th as follows: M. A. Jenkins, Sacramento, \$11,321; B. C. Gerwick, Inc., San Francisco, \$11,224. Contract awarded to B. C. Gerwick.

SAN LUIS OBISPO COUNTY—Reinforced concrete bridge across S. L. O. Creek. Dist. V, Rt. 2, Sec. E. Engineer's Est. \$34,868. Bids opened May 9th as follows: Paul M. White, Santa Monica, \$36,172.75; C. C. Gildersleeve, Pittsburg, \$34,999.90; R. B. McKenzie, Gerber, \$34,089; Holdener Const. Co., Sacramento, \$36,555; J. C. Butler, Los Angeles, \$33,585; Chas. and F. W. Steffen, San Diego, \$29,427.50; A. W. Kitchen, San Bernardino, \$34,326.14; Frederickson & Watson Construction Co., Oakland, \$39,324; Bent Bros., Inc., Los Angeles, \$36,930; Theo. M. Maino, San Luis Obispo, \$34,497.55. Contract awarded to Chas. and F. W. Steffen, \$29,427.50.

SAN MATEO COUNTY—Between La Honda road and Saratoga Gap, 13.8 miles to be graded and surfaced with crushed gravel or stone. Dist. IV, Rt. 55, Sec. D. E. & A. Engineer's Est. \$747,967. Bids opened April 11th as follows: Twohy Bros Company and J. F. Shea Co., of Oakland, \$652,238; A. Guthrie & Co. Inc., Portland, Oregon, \$892,745; Wren & Greenough, Portland, \$844,584; D. McDonald, Sacramento, \$847,738; Bechtel & Kaiser Rock Co., San Francisco, \$774,323; W. H. Rohl Co., Los Angeles, \$678,116; The Utah Construction Co., San Francisco, \$675,067; Marsh Bros. & Gardenier, Inc., San Francisco, \$772,786; J. F. Knapp, Stockton, \$651,381; D. A. Foley Construction Co., Los Angeles, \$1,083,728; George Pollock Co., Sacramento, \$893,222. Contract awarded to Twohy Bros. Co. & J. F. Shea Co. of Oakland for \$652,238.

SAN MATEO COUNTY—Between Broadway Station and 5th avenue, 3 miles to be graded and surfaced with crushed stone. Dist. IV, Rt. 68, Sec. B-C. Engineer's Est. \$169,032. Bids opened April 25th as follows: Granfield, Farrar and Carlin, San Francisco, \$134,726; Crescent & Grading Co., San Francisco, \$178,649; J. P. Holland, Inc., San Francisco, \$181,029; Stanley Const. Co., Palo Alto, \$134,444; C. W. Wood, Stockton, \$133,370; J. F. Collins, Stockton, \$144,605; Granite Const. Co., Watsonville, \$133,974. Contract awarded to C. W. Wood of Stockton for \$133,370.

SHASTA COUNTY—Across Boulder Creek, reinforced concrete bridge. Dist. II, Rt. 3, Sec. D. Engineer's Est. \$17,532. Bids opened April 11th as follows: R. B. McKenzie, Gerber, \$20,790; Noble Bros., San Jose, \$17,960; H. C. Whitty, Sanger, \$19,985; George I. Warren, San Francisco, \$19,905; A. Young, Yreka, \$202,250; R. Johnson, Glendale, \$18,525; J. P. Brennan, Redding, \$18,275; E. B. Skeels, Roseville, \$18,620; Holdener Const. Co., Sacramento, \$18,740; Kern & Kibbe, Portland, \$138,095. Contract awarded to Noble Bros. of San Jose for \$17,960.

SHASTA COUNTY—Between Conant and northerly boundary. 6.3 miles to be graded and surfaced with crushed gravel or stone. Dist. II, Rt. 3, Sec. D. Engineer's Est. \$270,649.90. Bids opened April 11th as follows: R. Johnson, Glendale, \$262,365.80; S. H. Palmer Co., San Francisco, \$301,653; Parker-Schram Co., Portland, \$279,011; Nevada Const. Co., Fallon, Nevada, \$305,565; Geo. Mitchell Co., Huntington Park, \$333,271; J. T. Logan, Medford, Oregon, \$278,644; C. W. Wood, Stockton, \$278,405; Holdener Const. Co., Sacramento, \$273,009; Kern & Kibbe, Portland, \$283,133. Contract awarded to R. Johnson for \$262,365.

SHASTA COUNTY—Between Montgomery Creek and 2 miles west of Burney, 17 miles to be surfaced with crushed gravel or stone. Dist. II, Rt. 28, Sec. C. Engineer's Est. \$47,375. Bids opened May 2d as follows: A. Milne of Portland, Ore., \$33,750; Chas. Harlowe, Jr., Oakland, \$49,000; J. P. Brennan, Redding, \$38,387.50; Wren & Greenough, Portland, \$46,600; E. B. Bishop, Sacramento, \$44,200; J. F. Collins, Stockton, \$41,850; Tieslau Bros., Berkeley, \$47,450. Contract awarded to A. Milne for \$33,750.

YOLO COUNTY—Between Yolo Causeway and $1\frac{1}{2}$ miles east, 1.5 miles grading and rock borders, oil treated. Dist. X, Rt. 6, Sec. C. Engineer's Est. \$23,077. Bids opened May 31st as follows: C. T. Malcom, Walnut Creek, \$22,126; Larsen Bros., Sonoma, \$16,462.50; D. McDonald, Sacramento, \$14,252.50; Mathews Const. Co., Sacramento, \$17,371; A. Teichert & Son, Inc., Sacramento, \$18,203. Contract awarded to D. McDonald for \$14,252.50.



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California Highways and Public Works

Official Journal of the Division of Highways
Department of Public Works
State of California



JULY-AUGUST
1928



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Bridges

*Along
the
State
High-
way
System*



Bridges on California State Highways

By C. E. ANDREW, Bridge Engineer.

IT HAS once been said that no objects in America more greatly mar the landscape than the bridges, and none in Europe are more attractive. This perhaps was true of a great portion of the older bridges constructed in America, particularly so of railroad bridges. The condition can be attributed

largely to the following causes:

Lack of artistic training in engineers, limited resources, competition and haste in construction, undesirable or unsymmetrical location, inadequate materials, absence of state or municipal supervision.

It is gratifying, indeed, to know that the age which

way made as a criticism on past practices. Not only California but every state in the Union has done likewise and nearly all are confronted by the same problem.

Engineers generally could not foresee the effect that the automobile would have. Nor did they have the money to provide for the increasing requirements even though some might have been able to predict the future. In many cases, then as well as now, it was, and is, economy to build not too far into the future if in so doing it is necessary to invest too large an amount of money.

FUTURE DEVELOPMENTS

We must all admit that even though we have in the last ten or fifteen years experienced the greatest transformation in the traffic requirements in history, it is still conceivable that still greater developments will occur.

The fact remains that we now have the large number of light, narrow and poorly aligned bridges and one of our hardest problems is to decide whether we should widen and strengthen our existing structures accepting a certain amount of overstress and its attendant inferiority or entirely remove or relocate and build new structures which will adequately take care of present and future traffic as we are able to predict it.

THE FLOOD PROBLEM

We find that often the problems of what to do about the present structures is much harder to solve than the design and construction of an entirely new structure. The bridges are widely distributed over more than 6000 miles of state highway in all conceivable sorts of climate and conditions. Foundations involve the worse and best conditions from solid rock to silt 200 and more feet deep. On many streams it is hardly conceivable to one unformed why a bridge 2000 feet long should be spanning nothing but sand or brush, and sometimes it is hard for an engineer to convince himself that it should remain so. Floods, however, become very convincing if one waits long enough.

It is probable that no other state has localities which are subject to more erratic or unexpected floods, all of which tend to complicate the bridge question.



C. E. ANDREW.

designed for strength alone is past, and the principal hindrances, as above mentioned, no longer stand in the way of building, in America, bridges that are most attractive and at the same time most adequate. In fact, an era of higher ideals in bridge designing has been assured in creating the necessity of having specialized and well trained men to do this work.

CALIFORNIA PROBLEMS

As to the general bridge situation in California, the problems confronting the Department are of rather vast proportions. As mentioned previously a large percentage of bridges now existing on our highways were built by the counties. As time passed these structures were gradually taken over by the state until in 1925 practically all of those which were of acceptable design were taken over for maintenance. The enormous increase in traffic both as to volume and weight, of which you are all aware, has very greatly complicated the general bridge situation.

Many, in fact the larger per cent of the bridges built by the counties were for much lighter loading than is now considered adequate. The roadways are necessarily much too narrow for the vastly increased traffic volume. The alignment in many cases is dangerous. These statements are not in any



Typical Bridges

Frontispiece—Upper picture, Doney Creek bridge on the Pacific Highway. Middle picture, bridge across Middle Fork of Smith River on Redwood Highway. Lower picture, bridge across Truckee River on Victory Highway.

This page—1. Merced River bridge at El Portal; 2. Bridge in Shasta County; 3. Upper Bear Creek bridge; 4. Feather River bridge at Oroville; 5. Bridge over South Fork of Merced River; 6. Sweetwater Creek bridge; 7. Wilson Creek bridge, Glenn County; 8. Bridge over Slough in Colusa County; 9. Redwood Timber bridge over Myrtle Creek; 10. Stoney Creek bridge.

Back cover picture: Donner Summit bridge.

on State Highways



There now exists on the state highway system between 1500 and 1600 bridges of over 20-foot spans. Almost all types of structure are among these as well as almost any degree of physical condition. Their combined length is approximately 42 miles and their combined cost approximately \$30,000,000.

BRIDGES FROM THE LAYMAN'S VIEW

It is, perhaps, safe to say that the strongest appeal modern highway bridge engineering has for laymen comes from the bold, spectacular structures which the scenic highway routes have made possible, and of which routes California has her due share. The more rugged and mountainous the country is, the more often such opportunity is presented and economically justified for constructing an attractive bridge. Against ill adopted structures in alignment and unsightly in appearance, perhaps constructed at an early date, and located in sections of the country which have little charm, suggest slight appeal of the profession to the layman, and only impress him with a feeling that a touch of a trained hand or service of a specialist is required in the fitting of a bridge to the needs of a highway.

BRIDGES FROM THE ENGINEER'S VIEW

Bridges and their construction appeal to engineers on account of the many engineering problems involved.

First and foremost is the problem of financing. Will a slight change in alignment giving a better but more expensive bridge be justified, and how wide should a bridge be constructed to take care of the heavy increasing traffic, are questions to be answered.

The investigation of foundation conditions is very important in order that the proper and best adapted materials will be selected for a bridge at any given location. The investigation of foundations should be so thorough that no change in type of foundation should be required after construction is under way. In selecting type of bridge, and kind of materials, it is important to take into consideration the climatic conditions in order that the structure will have a long life and will require a minimum amount of repairs and upkeep.

Investigation of the amount of opening for this waterway to provide unobstructed flow requires that a careful study be made as to the area of the water shed, the amount and rapidity of run-off. Structures built to offer obstructions to flow during extreme high water often cause scouring of channel that endangers the structure or approach roads.

Traffic Control and Highway Efficiency

By C. S. POPE, Construction Engineer.

A TEN-FOOT heavy traffic lane costs from \$15,000 to \$20,000 per mile to build, and the interest charge at $4\frac{1}{2}$ per cent is from \$675 to \$900 per year for the mile.

If traffic is efficiently controlled and the fullest use made of each lane, it may be possible to do with three lanes what might require four lanes under poor control. If one traffic officer can handle only five miles of road, he can be paid \$300 per month to handle traffic so efficiently that the construction of an extra lane for traffic may not be necessary.



C. S. POPE

Traffic control is therefore so closely bound up with economical highway design that the utmost cooperation between the traffic control department of a state and its highway organization is most necessary.

The Peninsula Highway is a case in point. It would be an interesting study to compare the traffic delivery on this road as at present operated with fast and slow lanes for traffic as against a strict control of traffic under which all vehicles are required to keep to the right at all times and to immediately turn into the right hand lane after passing a slower vehicle.

Studies in traffic control may show that the benefits to be derived from wider highways, expensive grade separations at cross roads or railroads may be secured more economically by a more drastic use of the police powers of the state, or the installation of gates or crossing men.

In selecting the kind of material a bridge is to be built of, concrete, steel, timber, treated or untreated, etc., it is important that no oversight is made in figuring the cost of raw material at its source, cost of transportation, cost of erection, painting, finishing and upkeep.

Records showing life of bridges, with cost of upkeep, are important so that the type of bridges built from year to year will give a maximum value for the money invested.

Complete plans and specifications that will insure against extra work being required

The Distribution of State Highway Money

By B. B. MEEK, Director of the State Department of Public Works.

THE MANNER in which California collects the funds by which its state highway is being constructed and maintained is familiar to the great majority of the people of this state. The laws and policies, however, that govern the distribution of this money are perhaps not so well known.

Briefly, one may summarize the general sources of state highway income as follows:

Taxes on gasoline, including the two-cent and one-cent tax.

Taxation imposed on highway transportation companies.

Registration of motor vehicles.

Federal aid.

Gifts and contributions.

The grand total of all such income for the biennium of 1927-1929, as near as it can be estimated, will be approximately \$50,000,000.

The distribution of this money is determined by certain very definite legal requirements and economic facts. For the purpose of clarity, these may be considered separately. The legal requirements for the distribution of highway money will be discussed first.

Two-cent gasoline tax—

This tax, collected by the state, is divided equally between the state and the counties. The counties' share of this money is in turn prorated on the basis of their relative automobile registration. The law requires that the state's share of this fund be devoted to widening, thickening, reconstruction and maintenance of existing highways. No portion of it may be used for new construction.

One-cent gasoline tax—The money derived from this tax goes in its entirety to the state highway system, and shall be used for new construction. However, it is subject, under the terms of the Breed Bill, to distribution both upon a geographical and a road-classification basis. The forty-five counties in the northern group receive 54.7 per cent of 75 per cent of the money raised under the bill for primary roads and 50 per cent of 25 per cent

of the money raised under the bill for secondary roads. The thirteen counties comprising the southern group receive 45.3 per cent of 75 per cent of the money raised under the bill for primary road construction, and the same quota for secondary roads as is accorded these state highways in the northern group of counties.

Registration fees—This money can be used only for the maintenance of state highways.

Taxation imposed on highway transportation companies—These funds are derived from taxes imposed on licensed carriers on the highway system of California. They are divided equally between the state and counties and the state's share of these moneys is dedicated exclusively to the maintenance and repair of highways.

Federal aid—These funds consist of contributions from the Federal road fund to California. The money thus contributed must be used on projects approved by the U. S. Bureau of Public Roads. That body will approve expenditures only within what is known as the State's Seven Per Cent System. This Seven Per Cent System is made up of selected highways within the state, the total mileage of which can not exceed seven per cent of the total highway mileage of the state. With a few minor

exceptions the mileage in the Seven Per Cent System consists of roads in the present state highway system.

Gifts and contributions—These are made up of donations of rights of way, or money, generally made by counties, but sometimes by corporations or individuals, and intended to promote the early improvement of some particular road project. By the terms of the gift or agreement these funds are dedicated to the use of the particular projects that they were designed to promote.

It will be apparent then that the discretion of the highway authorities in the expenditure of road money is confined within certain very definite limits established by the law. The factors that determine the exercise of these

How is state highway money spent?

How is its distribution determined?

To what extent is its disbursement controlled by law?

What policies govern state highway officials in the expenditure of road funds in the field where their power is discretionary?

In this article prepared for and first published in the California Tax Digest, B. B. Meek, director of the Department of Public Works answers these questions and tells of the laws, policies and mechanics that control the expenditure of state highway funds.

discretionary powers are largely economic. They may be summarized as follows:

Geographic distribution—The work requires a large geographic spread, not only to enable road service to be given to the whole state, but also to provide employment over the state and to prevent the undue disturbance of labor conditions that an over-concentration of work in any one place would cause.

Balanced development of highway system—There must be a coordination of development in the highway system of the state as between rural areas and urban communities. This is necessary in order that there may be an easy flow of traffic between the country and the city, between business and recreational areas, and between populated centers separated from each other by some distance.

Necessity for caring for traffic—Volume of traffic is again one of the determining factors in the distribution of highway money. The purpose of roads is to serve traffic. As Governor Young well put it "traffic pressure rather than political pressure" must determine where highway money is to be spent.

These are general principles that determine where and how highway money shall be spent within the limits fixed by law. They are applicable to large areas of the state and operative over large units. The question constantly arises, however, as to the policies that determine the priority of improvement in the smaller units, namely particular roads.

The answer to this question is that those sections of any given highway are first improved that will make possible the greatest general improvement to the whole road. This priority may be determined by the volume of travel that some particular section of highway is called upon to serve. Again it may be determined by the physical condition of some section. In any event sequence in improvement in any highway as between its various sections is determined by a consideration of the relative benefit that will be conferred upon the traveling public.

THE ELEMENT OF TIME

It must be recognized that the highways of California can not be built except over a period of years. The desire of the Department is that they be completed as rapidly as is compatible with sound engineering economic construction. Haste is desired but waste will not be knowingly tolerated.

There are also certain construction factors that enter into the distribution of highway money.

Thus the Department of Public Works through its Division of Highways is making a most careful study of the state highway system of California in an effort to develop a ten-year building program through which waste and duplicated effort will be reduced to a minimum, with a consequent saving of many millions of dollars to the taxpayers of California.

CONSTRUCTION FACTORS

Again a close study of each is being made to determine the type of highway that will adequately serve the traffic of that road. It is hoped that this study will enable the Division of Highways to avoid the danger of both underbuilding and overbuilding highways.

An effort is being made to look into the future so that rights of way can be secured that will permit the development of the highway system to proceed in an economical manner, serving future traffic in an orderly manner as that traffic develops.

Types of low cost pavement are being developed that will permit the early improvement of a large mileage of state highways where the present traffic use is relatively small. These pavements are so designed that they will become a satisfactory base for a higher standard of pavement when increased traffic requires such better pavement.

These are the policies that govern the distribution of construction and reconstruction money.

MAINTENANCE EXPENDITURES

The expenditure of maintenance money is governed by the necessity for maintenance. Two factors determine the distribution of the expenditure of these funds. They are:

First, the necessity to adequately care for traffic.

Second, the necessity to adequately protect the investment in highways.

General maintenance allotments to the various roads are determined largely by the relative volume of travel over those roads and the age and condition of the highways.

Specific and emergency allotments are determined by special conditions that may exist requiring special maintenance either to protect existing highways from actual damage or anticipated deterioration or to care for unexpected or unusual traffic that may develop.

Early maintenance is the demand of highway officials from the maintenance forces. "Every Maintenance Man a Minute Man" is the slogan of the Department.

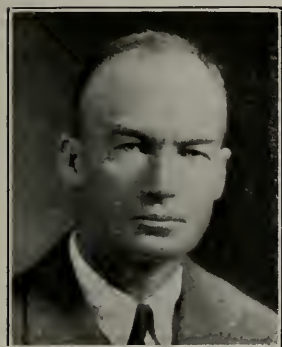
(Continued on page 24.)

The July Traffic Count

By T. H. DENNIS, Maintenance Engineer.

ON JULY 15th and 16th the semiannual count of traffic on the state highways was made. A few stations on the Redwood Highway were not taken until July 22d and 23d.

This count is made regularly each year by the maintenance organization of the Division of Highways on the Sunday and Monday nearest the middle of January and July at some 836 stations. The count covers the hours from 6 a.m. to 10 p.m. each day. The count was first initiated in 1920 and 1922. Since 1924 the count has been taken at regular intervals at a complete system of stations. The records thus obtained become yearly more valuable. The information serves as a guide in the planning of new construction and reconstruction of roads and bridges and in the allocation of maintenance funds. It is sought by many industrial and commercial companies as an aid in their work.



T. H. DENNIS

The field record is made by hourly periods. Vehicles are segregated as follows: Automobiles, light trucks, heavy trucks, trailers, buses, tractors and horse-drawn. The number of foreign cars; that is, cars registered outside the state are shown separately.

The information has been summarized in some detail below. It is presented in the same form as the count of January 15th and 16th which was published in the February-March issue of this journal.

The July, 1928, count shows the following variations from the count of July, 1927:

	Sunday	Monday
Main north and south routes-----	+ 9%	+8%
Laterals between inland and coast routes-----	- 4%	-4%
Interstate connection routes-----	- 1%	-1%
Recreational routes-----	+17%	+7%

The percentage gain or loss in comparison with the count of July, 1927, is shown for the various state routes:

Route No.	Sunday Gain %	Sunday Loss %	Monday Gain %	Monday Loss %
1. Sausalito to Oregon line-----	13		2	
2. San Francisco to San Diego----	6		5	
3. Sacramento to Oregon line via Marysville-----	13		11	

Route No.	Sunday Gain %	Sunday Loss %	Monday Gain %	Monday Loss %
4. Sacramento to Los Angeles (Valley Rt.)-----	16		17	
5. Stockton to Santa Cruz via Oakland-----		7		6
6. Sacramento to Woodland junction-----	11		16	
7. Tehama Junction to Benicia----	8		18	
8. Ignacio to Cordelia via Napa----		13		14
9. San Fernando to San Bernardino-----		3		5
10. San Lucas to Sequoia National Park-----	2		8	
11. Sacramento to Riverton via Placerville-----	9		7	
12. San Diego to El Centro-----	3			11
13. Salida to Sonora-----	7		17	
14. Albany to Martinez-----	9			2
15. Route 1 near Calpella to Grass Valley-----		2		3
16. Hopland to Lakeport-----	12		6	
17. Roseville to Nevada City-----		2		6
18. Merced to El Portal-----	15			4
19. Route 9 west of Claremont to Riverside-----	8		16	
*20. Redding to Route 1 near Arcata-----	99		27	
21. Route 3 near Richvale to Quincy-----		7		2
22. San Juan Bautista to Route 32 via Hollister-----	19		5	
23. Saugus to Bishop-----	12		6	
24. Route 4 near Lodi to Valley Springs-----	10		2	
25. Nevada City to Downieville----	8		0	0
26. San Bernardino to El Centro----		9		2
27. El Centro to Yuma-----		9	16	
28. Redding to Nevada line via Alturas-----		2	8	
29. Red Bluff to Nevada line via Susanville-----	13		16	
31. San Bernardino to Jean-----	5		5	
32. Route 4 near Califa to Route 2 at Gilroy-----	25		26	
33. Route 4 near Bakersfield to Paso Robles-----		1		5
34. Route 4 near Arno to Pine Grove-----		6	0	0
37. Auburn to Colfax-----		2		7
43. San Bernardino to Big Bear Lake-----	42		6	
44. Boulder Creek to Redwood Park-----	6		14	
*47. Orland to Chico-----	52			12
*48. McDonalds to Wendling-----		23	47	
49. Calistoga to Lower Lake-----	22		26	
51. Santa Rosa to Schellville-----	22		6	
*52. Alto to Tiburon-----	56		36	
53. Fairfield to Lodi-----		4	13	
55. San Francisco to Spring Valley Dam-----		4	29	
57. Santa Maria to Bodfish via Bakersfield-----		16		21
*58. Mojave to Topoc-----	48		25	
60. El Rio to San Juan Capistrano--	28		5	
*64. Mecca to Blythe-----	69		57	
65. Auburn to Sonora-----	16		27	
*66. Manteca to Route 5 near Mossdale School-----	73		75	
68. San Francisco to Burlingame--		15		7
71. Crescent City to Oregon line--		6	53	
Average of all routes-----	7		6	

The routes marked * show an unusual increase in percentage which is due in some cases to construction operations which necessitates detouring traffic from some regular route. For instance route 66 is carrying the traffic which normally goes from French Camp to Mossdale. The average of all routes is more representative of the increase in traffic throughout the state in 1928 over the same

period in 1927 as the small counts on the lateral routes and the detoured traffic assume more nearly their true relation.

The actual counts as taken at the most representative points are shown in the following table in comparison with the July count of last year:

Route 1. San Francisco to Oregon Line

Station	July, 1927		July, 1928	
	Sum. 17	Mon. 18	Sum. 15	Mon. 16
San Rafael, north of city at top of hill	8,965	3,847	12,226	4,807
Petaluma, north of city	8,942	6,019	10,813	6,539
Santa Rosa, south of city: Triangle service station	4,191	2,876	4,606	2,967
Santa Rosa, north of city at railroad crossing	5,103	3,641	5,399	3,846
Headsburg, south of city at railroad crossing	3,691	2,860	4,055	2,602
Ukiah, south of city, junction route 70	1,873	1,733	2,211	1,987
Ukiah, north of city, junction route 15 to Colusa	1,961	1,536	1,961	1,515
Willits, north of city, junction road to Ft. Bragg	1,179	1,068	1,363	963
Eureka, south of city limits	4,038	2,573	4,054	2,995
Arcata, north of city at junction route 20	2,207	2,048	901	452
Crescent City, junction of road	1,039	1,042	1,052	taken
At Oregon line	380	362	578	472

Route 2. San Francisco to San Diego

Colma, junction road to South San Francisco	18,802	8,559	24,855	10,133
San Bruno Junction Bay Shore Road	25,220	11,049	24,051	10,496
San Mateo, south of city at 16th Ave.	26,001	12,480	29,163	12,698
Hedwood City, north of city limits	23,001	11,199	25,474	11,771
Palo Alto, at road to Federal Tel. Sta.	18,837	8,466	18,700	8,774
San Jose, north of city at lumber yard	19,326	20,023	20,548	21,856
San Jose, south of city limits	9,191	6,562	10,151	8,652
Gilroy, north of city, junction road to Watsonville	7,303	5,156	8,481	5,916
Salinas, south of city limits	3,517	3,175	3,966	3,709
Paso Robles, north of city limits	2,509	2,009	2,730	2,335
Paso Robles, south of city limits	3,122	2,586	3,488	2,777
San Luis Obispo, north of city limits	3,477	2,562	3,191	3,297
San Luis Obispo, south of city limits at railroad crossing	4,787	3,538	no count	
Santa Maria, north of city junction, Route 57 to Bakersfield	3,636	2,379	4,046	2,759
Santa Barbara, west of city, junction San Marcos road	5,494	3,501	5,977	3,535
Santa Barbara, 300 feet east of city limits	8,470	6,892	9,524	7,708
Ventura, west of city at bridge	6,128	4,046	8,069	4,646
Ventura, east of city limits	7,100	4,649	7,472	5,672
Los Angeles, east at Indiana St.	22,385	21,185	22,356	21,311
Whittier, at junction with Hadley St.	12,354	8,862	15,216	10,459
Anaheim, north of city limits	11,403	9,559	14,927	9,731
Santa Ana, north of city at junction county road to Orange	12,911	7,905	12,567	7,621
San Juan Capistrano, north of city	6,047	3,096	4,945	2,230
Oceanside, near south city limits	7,168	4,282	8,485	5,278
Delmar, at Santa Fe Railroad crossing	6,695	3,788	8,005	3,838

Route 3. Sacramento to Oregon Line, via Marysville

Sacramento, north at junction with Garden Highway	11,693	10,891	12,690	12,096
Marysville, south of city at junction Hamilton road	2,050	1,961	2,869	2,650
Yuba City, north of city at junction, route 15	3,129	3,065	3,600	3,736
Chico at junction county road to De Saba	1,585	2,257	3,051	2,467
Chico, north of city, junction county road east	2,136	1,902	2,109	1,911
Red Bluff, at junction route 29 to Susanville	1,259	1,451	1,554	1,515
Redding, south of city, junction route 28 to Alturas	2,270	2,281	2,393	2,286
Dunsmuir, north of city limits at bridge	3,888	3,365	3,700	3,375
Yreka, south city limits	2,225	1,921	2,431	2,342
At Oregon line	1,465	1,260	1,568	1,372

Route 4. Sacramento to Los Angeles (Valley Route)

Sacramento, south of city limits	7,001	6,283	7,174	6,591
Lodi, junction route 21 to San Andreas	3,403	2,732	3,866	2,857
Stockton, north of city, junction county road to Lockeford	6,199	5,159	6,111	5,227
Modesto, north of city	6,297	5,202	7,189	6,258
Modesto, south of city	4,597	4,319	7,942	7,210
Turlock, north of city	4,674	3,932	5,958	5,473

Station	July, 1927		July, 1928	
	Sum. 17	Mon. 18	Sum. 15	Mon. 16
Turlock, south of city	3,771	3,099	4,986	3,996
Atwater, north of city	3,924	3,290	4,155	3,483
Merced, north of city at bridge	1,922	4,307	5,492	4,452
Merced, south of city at bridge	3,441	3,199	3,572	3,663
Fresno, south at maintenance yard	8,121	8,129	8,387	8,349
Kingsburg, south of city near Kings River bridge	2,980	2,314	3,522	2,660
Tulare, south city limits	3,264	2,750	2,956	2,610
Bakersfield, north of city, junction county road to Oil Center	5,643	5,973	6,365	6,425
Castale, junction county road to Santa Paula	1,829	1,120	4,026	2,863
Saugus, junction route 23 to Mojave	6,334	4,026	6,760	1,142
Newhall, end of section L.A.-I-E	7,680	4,108	8,509	5,415

Route 5. Stockton to Santa Cruz via Oakland

Tracy, west of city, junction county road to Byron	4,698	2,744	5,939	3,313
Livermore, east of city, junction county road to Livermore	5,280	3,410	3,486	1,942
Hayward, junction with Castro Valley road	4,449	2,277	4,201	1,623
Niles, junction Niles Canyon road	12,989	6,388	6,116	3,453
Nine miles north of San Jose, junction county road to Centerville	14,188	4,834	8,081	3,169
Five miles north of San Jose	13,542	5,661	13,384	6,019
San Jose, at north city limits	8,932	4,716	9,945	5,011
San Jose, west of city at sanitarium	9,962	9,498	11,015	8,961
Los Gatos, northeast of city	6,213	2,787	6,765	2,995
Santa Cruz, north of city	7,712	2,691	8,254	2,668

Route 6. Sacramento to Woodland Junction

West of Sacramento, at underpass	5,319	3,683	6,131	4,528
Davis, east of city, at underpass	4,513	3,162	4,794	3,458

Route 7. Tehama Junction to Benicia

Benicia, north of city	794	413	779	444
Fairfield, east of city	5,093	3,215	5,418	3,304
Dixon, south of city	4,017	2,704	4,137	3,048
Woodland, south of city	2,679	2,311	2,615	2,646
Williams, south of city	1,423	1,130	1,648	1,322
Willows, south of city	1,737	1,757	1,690	1,836
Orland, at junction route 47 to Chico	1,571	1,473	1,827	2,456
Red Bluff, south of city at Reed Creek bridge	1,435	1,453	1,757	1,942

Route 8. Ignacio to Cordelia via Napa.

Petaluma Creek bridge	not taken		not taken	
Scheffville, junction route 51 to Santa Rosa	2,184	880	2,126	1,000
Napa, junction county road to Vallejo	8,619	3,913	6,111	2,802
Cordelia, junction route 7	4,710	2,887	5,169	2,973

Route 9. San Fernando to San Bernardino

San Fernando, 1 mile east	2,721	1,290	Relinquished to city of L. A.	
La Crescenta, west of Pennsylvania Ave.	6,764	4,124	6,474	3,317
Pasadena, east of city limits	10,621	7,001	8,951	6,083
Azusa, west of city limits	9,503	4,998	10,670	5,408
Upland, east of city at junction county road to Upland	4,582	2,299	3,899	2,182
San Bernardino, west of city	5,088	3,807	5,423	4,186

Route 10. San Lucas to Sequoia National Park

San Lucas, south of city at junction route 2	123	156	110	155
Coalinga, west of city	442	396	383	319
Hanford, west of city limits	1,602	1,751	1,612	2,025
Hanford, east of city, intersection; county road to Kingsburg and south to Corcoran	2,829	2,611	2,865	2,872
Visalia, east of city at Exeter Junction	1,801	1,554	1,961	1,603

Route 11. Sacramento to Nevada Line via Placerville

Sacramento, east of city limits	3,811	3,033	4,352	2,971
Polsom, west of city at junction with Pratts road	1,850	1,083	1,774	1,005
Placerville, west of city	1,834	1,143	2,175	1,446
Placerville, east of city	1,876	1,216	1,995	1,368
Between Riverton and Kyburz	1,132	546	1,112	702

Route 12. San Diego to El Centro

San Diego, east of city, Euclid Ave. at Cajon Ave.	4,382	4,517	under const.	
El Cajon, west of city limits	3,577	4,463	6,267	4,093
Jacumba, at junction county road to El Campo	1,271	560	1,346	690
El Centro, west of city at junction route 26 to San Bernardino	2,438	2,303	1,990	1,769

(Continued on page 22.)

Maintaining the State Highways

By W. A. SMITH, Assistant Maintenance Engineer.

THE MAINTENANCE of the state highways is highly important to the social and economic welfare of California. Money has been invested not alone in the building of the roads, but also in ranches, stores, factories and the many varied activities of the state, as a direct result of opportunities offered by improved transportation. Continued success of such industries is dependent on continued ease of communication.



W. A. SMITH

It is the duty of the maintenance department of the Division of Highways to preserve the investment and to provide service and insure safety for the stream of traffic that

flows over these channels of communication. As an organization we believe this work to be more than a duty.

In this work it is especially essential that a man shall feel *his* job to be important. Maintenance is the doing of little things; the endless repetition of the same tasks. Occasionally there is an emergency to test the metal of a man but, in general, the better the maintenance the less is the need for extensive repairs. A man who is not guided by a high spirit of loyalty and service will never make a "*Highway Man*."

The growth of the work has been gradual with the development of the highway system. Nearly every condition of climate and soil must be dealt with from the snow and rain of the mountains and coast to the summer dryness of the valleys and the heat and sand of the desert. Every type of traffic

must be served; heavy, long distance freight hauling, high speed tourist traffic and the congestion of the city street.

The Governor's budget for the present two-year period provides \$9,580,000 for the needs of the maintenance department. This sum is being expended for routine maintenance, for emergency work in connection with removal of major slides, specific improvement and storm damage, for oiling gravel and crushed rock roads and for purchase of property and construction of improvements thereon for use as headquarters for the crews. The investment in maintenance stations is of a permanent character which will increase in value. The work of oiling roads is of a semi-permanent nature as it conserves material already in place. Some of the specific work is also of an enduring nature, for instance: super-elevating curves, improving sight distances, drainage, etc.

The annual operating expenditure is approximately \$4,500,000. This is a large sum, but when it is remembered that over 1,700,000 vehicles were registered in 1927, and that the annual upkeep of your state highways, exclusive of reconstruction, cost less than \$2.70 for each vehicle, the economy is obvious. A few bumps against shattered concrete, a few hours slow driving on rough roads result in damage to your car and loss of your time far in excess of this sum. The investment in motor equipment is so great and operating costs so high that first class maintenance is economically justified.

The maintenance department is not only interested in the upkeep of the roads, but is concerned in the control and eradication of noxious weeds; in caring for the natural and planted trees; in assisting toward proper improvement of the highway by limiting encroachments which would interfere with future development or cause an unsightly appearance; in reducing fire hazards; in safeguarding your children by maintaining warning signs at schools; and in pro-

DISTRIBUTION OF 1927 MAINTENANCE DOLLAR ON STATE HIGHWAYS

Class of Work

Where spent	Amount of each dollar spent
Traveled way	54.5 cents
Road sides	30.7 cents
Improvement of shoulders	3.0 cents
Structures	6.4 cents
Safety devices	2.0 cents
Drifts	0.6 cent
Trees	1.2 cents
Miscellaneous	1.6 cents
Total	\$1.00

Class of Expenditure

Labor	44.2 cents
Equipment cost	32.8 cents
Materials	20.6 cents
Service and expense	2.4 cents
Total	\$1.00

Protecting the Freshly Painted Traffic Line



Flagging the white stripe.

Even with the use of very fast drying paint for traffic lines, it has been quite difficult to prevent vehicles from running over the freshly painted line and tracking it to other parts of the pavement.

The paint is applied with such rapidity that great lengths of line are painted in a very few minutes, and to station flagmen along the highway to direct traffic, for they would have to be numerous, would be too expensive. The placing of an occasional sign

along the newly painted line helps, but it is not sufficient.

A method of protecting the freshly painted traffic line, developed in District VII and which has been very successful, consists of the use of a great many small red flags placed at intervals of from five to six feet along the newly painted line.

The device for supporting the small piece of red flagging consists of a piece of No. 8 iron wire bent with a loop about six inches in diameter for a base, with a single strand of the wire, about six inches long, at right angles to the plane of the base and having a small loop or kink at the end to receive the piece of flagging.

The little flags and their supports are so light and capable of being stacked, that a man can easily carry a hundred or more on his arm. He walks immediately in back of paint machine placing the flags about five feet apart along the line.

Three parallel white lines were recently painted to establish lanes along Whittier boulevard in Los Angeles County, and the work was protected with the little red flags. In several miles of lines painted, not one case of smearing of the fresh paint occurred, in spite of the fact that the traffic count during working hours along this stretch of highway averages more than 1200 vehicles per hour.

BAD ROADS ARE A COSTLY TAX

Poor roads are costly to motorists. Motorists of the United States, according to dispatches, pay a bad roads tax equivalent to 22.3 cents on every gallon of gasoline consumed on a poor highway.

Experiments at Washington State College, Iowa State College, and the North Carolina State College, show that on a basis of speed of 33 miles an hour, the cost in tires and gasoline per 1000 miles over a certain rough road for an average four-cylinder car weighing 3500 pounds loaded, was \$35.10. At the same speed, the cost for the same car over a very smooth, improved road was only \$12.80.

CORRECTION

In the issue of CALIFORNIA HIGHWAYS AND PUBLIC WORKS for May-June an error was made in the statement of equipment used on two projects listed there. In District IV, San Mateo County, Route 2, Section A, Haurahan Company, contractors, the mixer used was a No. 27-E MultiFoot Paver. In District VII, Orange County, Route 2, Section B, George Herz Company, contractor, the same paver was used.

teeting traffic by means of traffic lines and other devices.

The organization engaged in this work varies from 1400 to 1700 men depending on the season. The 200 engineers, superintendents and foremen in charge have been carefully selected. Many of the men have been with the state since the start of highway work in 1912. The average length of service for these 200 men is 7 years. In every county of the state these men are daily patrolling the state highways, trained and equipped for the detail of routine work, but ready at a moment's notice for the emergencies of fire, storm or flood.

The accompanying table shows under "class of work" the portion of each dollar expended in 1927 on various phases of routine maintenance. This represents the service given for your dollar. Under "class of expenditure" is shown the proportion of this same dollar as it is returned to the citizens of the state in payment for labor, for purchase and upkeep of equipment, for materials and miscellaneous expense.

Congress Adds Over \$6,000,000 to California Highway Building Fund

By T. E. STANTON, Assistant State Highway Engineer.

THE seventieth congress, just closed, continued the constructive policy of the United States government in furnishing federal funds for cooperation with the states in road building activities. This was done by the passage of the bill authorizing appropriations of \$75,000,000 annually for 1930 and 1931 for federal aid cooperation with the state highway departments and an additional \$7,500,000 annually for forest highway and trail construction and maintenance, making a total of \$165,000,000 for the two years.

By this action, the United States government has committed itself to appropriations totaling \$1,087,088,330 since the policy of federal aid was first inaugurated. For this total commitment, California has already profited or will have profited by the end of 1931 to the extent of over \$43,000,000.

CALIFORNIA'S SHARE

California's share of the 1930 and 1931 appropriations will amount to approximately \$2,500,000 annually for federal aid on the 7 per cent system and an addition of approximately \$625,000 annually for forest highway construction, or a total of approximately \$6,250,000 for the biennium exclusive of forest development funds which will be available to the Forest Service for the development of roads and trails necessary for the opening up and protection of the national forests.

Following is a summary of California's share of federal aid appropriations to date and expenditures or obligations incurred in connection therewith:

Total appropriations to June 30, 1929	\$27,042,667 00
Appropriated by 70th Congress for 1930 and 1931 fiscal years (California's share approximately)	4,972,830 00
California's total share of appropriations to date	\$32,015,497 00

OBLIGATIONS—JULY 1, 1928

(a) Projects completed and paid for	\$19,858,085 42
(b) Projects in force and under agreement	2,996,543 89
(c) Plans, specifications and estimates recommended for agreement	1,153,892 35
(d) Estimates submitted for agreement	161,885 44
(e) Estimates to be submitted; contracts pending award or advertised	717,600 00
Total amount obligated	\$24,888,007 10
Balance available for additional projects up to June 30, 1931	\$7,127,489 90

Federal aid, other than forest highway appropriations, comes to the states as a reimbursement for expenditures made by them in highway construction on what is known as the 7 per cent system.

The 7 per cent system is a system approved by the United States government, in connection with the construction of which federal aid will be extended to the states by the government, and which consists of 7 per cent of the estimated road mileage at the time of the adoption of the Federal Aid Act of 1921.

At that time, the California Highway Commission determined the total road mileage in the state to be 70,000 miles, so that 4900 miles of highways in California could be designated as federal aid highways.

MAY PLANT TREES

Senate Bill No. 1341 by Oddie, which has just been passed by the seventieth congress and signed by the President, provides that in every case in which, in the judgment of the Secretary of Agriculture and the highway department of the state in question it shall be practicable to plant and maintain shade trees along the highways, the planting of such trees shall be included in the specifications.

The above provision makes permissible the expenditure of federal aid money in the planting of shade trees.

OTHER PROVISIONS

The Oddie bill likewise provides that federal funds may be expended on that portion of a highway or street within a municipality having a population of 2500 or more, along which from a point on the corporate limits inwardly, the houses average more than 200 feet apart; provided, that no federal funds shall be expended for the construction of any bridge within or partly within any municipality having a population of more than 30,000 as shown by the latest available federal or state census; but this limitation shall not apply in the case of an interstate bridge, including approaches, connecting such municipality in one state with a point in an adjoining state which may be within a municipality having a population of not more than 10,000.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

BERT B. MEEK-----Director
GEORGE C. MANSFIELD-----Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 5 JULY, 1928 No. 7

DIVISION OF HIGHWAYS DEPARTMENT OF PUBLIC WORKS STATE OF CALIFORNIA

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General Headquarters, Third Floor, Highway Building,
Eleventh and P Streets, Sacramento, California.

CALIFORNIA HIGHWAY RIGHTS OF WAY KEPT FREE FROM BILL BOARDS

The action of the highway commission of Arizona in ordering advertising signs and bill boards off the rights of way of the state highways of that state has been widely commended in the editorial columns of the newspapers of California. A number of these editorials, however, mix with their praise of the action of the Arizona officials, the suggestion that California highway authorities should do likewise.

For the information of both the press and the public of California, it might be well to call attention to the fact that all advertising signs and devices have been barred from the rights of way of California's state highways since 1915. Chapter 400, Statutes of California, enacted in 1915 reads in part as follows:

"Sec. 6. No sign, picture, transparency, advertisement or mechanical advertising device shall be placed upon or over any state road or highway without a permit from the department of engineering or its appropriate officers, and, if so placed, shall be a public nuisance and may be forthwith removed from any such road or highway by the department of engineering, its officers or employees, and any person who shall so place the same shall be GUILTY OF A MISDEMEANOR; provided further, that nothing herein shall be so construed as to prevent the posting of any notice provided by law or order of any court to be posted."

This law has been very rigorously enforced in California, and it is made the special duty of state highway maintenance forces to see that the law is obeyed to the letter.

The method by which this law is enforced in California is to warn all persons found posting signs or building bill boards on the rights of way of the state highway system that their action constitutes a violation of the law. Where signs have been placed on the highway before their posting could be stopped a formal notice is served upon the owners of the signs that they must be removed immediately. If the signs are not forthwith removed by the owners, state highway officials immediately clear the highway right of way of the offending advertisements.

Vigorous enforcement of the 1915 law has resulted in freeing rights of way of both bill boards and posters.

It may be of interest to the public to read the text of the notice served upon those responsible for erecting bill boards or posting signs in the forbidden right of way area. This notice reads:

MEMORIAL OPPORTUNITY SEEN IN ELIMINATION OF GRADE CROSSINGS

The following editorial appeared in the *San Francisco Chronicle*:

For persons who wish to create monuments for themselves or for others the erection of splendid structures to carry highways over or under dangerous railroad crossings is an unequalled opportunity.

The task of eliminating grade crossings on all the highways of the state is so vast that it must be many years before it is all done. Here is a chance to set up lasting memorials that will have the added value of testimonials to the humane interest and public spirit of their givers.

Such givers may be assured that the Highway Commission will not be niggardly in full and permanent public acknowledgment of their benefactions. A grateful state will see that official titles and enduring bronze keep the memorial purpose always before the public.

Though in a slightly different form, we have already striking examples of this combined purpose of memorial and public benefaction in the gifts of beautiful groves along the Redwood Highway. Four fine redwood groves on this highway have been presented to the state by private persons as memorials to their loved ones. The groves now known to all travelers over the Redwood Highway as the Raynal C. Bolling, the Charles N. Felton, the Frederick Saltonstall Gould and the Joseph Russ will keep those names green in the ever-living trees and at the same time will pleasure generation after generation.

So, too, fine structures to carry the highways over or under dangerous railroad crossings will cause generations of highway users

to bless the names that stand on their memorial tablets.

Surely there must be a great satisfaction in the public honor attending such meritorious enterprise and concern for the life and safety of the millions upon the highways, far beyond that which comes from purely ornamental memorials.

MEMORIAL MARKER ON VICTORY HIGHWAY FORMALLY DEDICATED

The front cover picture for this issue of CALIFORNIA HIGHWAYS AND PUBLIC WORKS is a view of the State of California Memorial Marker on the Victory Highway at Verdi, California. This marker was dedicated on July 24, 1928, with James K. Fisk, adjutant, The American Legion, Department of California, presiding. The following program was rendered:

Invocation

Frank Davis, Chaplain, Hague-Thomas-Hegarty Post 130, Grass Valley.

Address

By W. A. Shepard, California Commissioner, Victory Highway Association.

Address

Mrs. Cora M. Woodbridge, Assemblywoman, Ninth District.

Address

J. C. Durham, Reno and A. W. Moore, Oakland, Directors, Victory Highway Association.

Address

By George W. Malone, Commander, American Legion, Department of Nevada.

Address

Hon. Frederick Balzar, Governor of Nevada.

Address

Hon. C. C. Young, Governor of California.

STATE OF CALIFORNIA CALIFORNIA HIGHWAY COMMISSION

192--

We note that a-----advertisement reading-----

has been placed within the limits of the State Highway at-----

Your attention is called to the following from Statutes of California, 1915, Chapter 400: (printed above).

Such advertisement being in violation of the law you are advised to remove same from limits of highway within-----days from date, otherwise action will be instituted against you according to the law in such cases provided.

Yours very truly,

-----Division Engineer

State Scales Prove Effective Detectors of Overloading Violations

[From San Bernardino *Index*]

Judge Lee Childers is busy with traffic cases, due to the overloaded trucks here, or trucks with too little rubber, that persist in traveling over highways. The state scales located between Banning and Beaumont are responsible for the detection of offenders.

FLORIDA—The Tamiami Trail, a 300-mile highway crossing the Everglades from Miami to Tampa, was completed last fall after fourteen years of effort and millions of dollars expenditure.

West End of the Yolo Causeway

Lowered; How Job Was Accomplished

By C. E. BOVEY, District Maintenance Engineer.

THE Yolo Causeway situated in Yolo County has on the west end 2470 lineal feet of wooden trestle, the grade line of which is 6 feet higher than the paved highway connecting it. The run-off as constructed was very short and the vertical curve in the trestle itself is only 75 feet in length, giving a sight distance of less than 500 lineal feet. On account of the fast traffic across and adjacent to the causeway, a great many accidents have occurred due to this short sight distance.

As on all wooden deck bridges topped with asphalt surface, moisture gathered during the night and in freezing weather turned to ice, creating a more hazardous condition during the night and early morning hours. As the wheel guard and guard rail on this trestle were of the old standard type, they proved insufficient to keep skidding machines from crashing through to the ground some eighteen feet below. To correct this condition, it was decided to resurface the trestle with a non-skid layer of $\frac{3}{4}$ -inch rock and asphalt and replace the old wheel guard and guard rail with a new and heavier type, the wheel guard to be constructed of 8-inch by 12-foot timber placed on 3-foot blocks, making it 15 feet high, which is one inch higher than the concrete wheel guard on the main structure, which has always proven sufficient to keep

decided to lower the last nineteen bents of the wooden trestle in order to substitute a 400-foot vertical curve in place of the 75-foot one, thus increasing the sight distance of less than 500 feet to over 1500 lineal feet, thereby



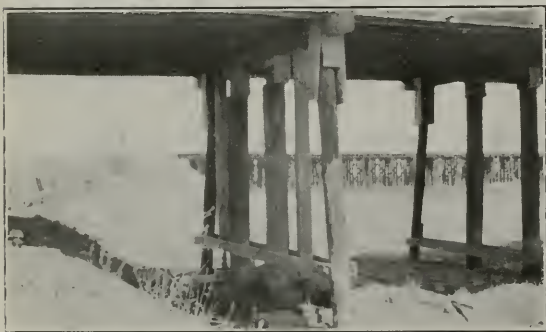
Showing the jacks in place and the crew making the cut-offs. Note the swinging stage from which the men are working.

materially adding to the safety of the traveling public.

The bents were of the standard four-pile type, the two outer piles being on a batter.

It was decided to contract the lowering of the trestle and the placing of new wheel guard and guard rail, but the bids received were all entirely too high and were, therefore, rejected. Most of the bids were particularly high for the lowering item ranging from \$1,000 to \$3,808, while the Engineer's estimate was \$600. The highest bidder on the lowering of the trestle was the lowest bidder on the placing of the wheel guard and guard rail, and it was thought best by the district office, since the contractors were evidently worried about the lowering of the trestle, to have the lowering done by state forces and to readvertise for bids for the placing of the wheel guard and guard rail. Therefore, the lowering of the nineteen bents was undertaken with the district maintenance forces, using a crew of four men under the leadership of Foreman D. G. Hasse of Stockton.

The cut-offs ranged from one inch to two feet. All the sway brace bolts and braces had to be removed first and then jacks placed under each bent separately, the cap raised just enough to take the weight off the piles



Showing the bents after cut-offs have been made with 4"x12" shims in place and showing part of the scabs holding them in place.

machines from crashing through; the guard rail to be constructed of 8 by 8 posts and 6 by 6 railing securely bolted to the stringers and wheel guard.

In addition to these corrections, it was

while they were being cut off to the new grade.

The old drift bolts extended into the piles approximately 10 inches and in most cases were left intact.

Where the cut-off was over 12 inches, the drift bolts were cut off at the cap for the batter piles, because of the change in the position of the drift bolt with respect to the pile.

In order to save cutting as many drift bolts as possible and the driving of new ones, the old drift bolts were forced into the pile below the cut-off by placing blocks between the deck and the cap directly over the top of the drift bolts. The weight of the deck forced the drift bolt into place without any difficulty. Where the drift bolts were removed, new ones were placed by boring through the deck and cap and driving them into place by use of a follower.

A swinging stage was used entirely, the staging being suspended from the wheel guard. This proved far more economical than staging nailed to the piles or set-up on the ground.

It was planned to lower the deck not over four inches at a time, therefore, as soon as the cut-offs were made, 12 by 4 shims were placed between the top of the pile and cap and held firmly in place by 2 by 12 scabs nailed to the cap and piles. Where the cut-off was less than four inches, the deck was lowered to position as soon as the cut-off was made. After all cut-offs were made, the deck was lowered four inches by removing the 4-inch shims, and this process continued until the entire deck was in place. Sway braces and drift bolts were then replaced and the tops of all piles were treated with creosote paint in order to make them conform with the original job.

The only difficulty encountered was caused by the springing of the piles. Many of them, after the cut-offs were made sprung as much as three feet out of line and had to be pulled back into place and anchored, which raised the cost considerably.

The final cost bore out the judgment of the district office, as the entire lowering was completed for slightly less than \$550 as compared with the low bid of \$1,000.

Some of the contractors, in bidding, figured on having house movers do the lowering by placing jacks under all of the nineteen bents and lowering simultaneously. House movers, however, wanted approximately \$1,200 to do the work in this manner, while our four-man maintenance crew handled the work very efficiently, doing an excellent job for only

HIGHWAYS MAY SERVE TO HALT FIRES, ALSO

Highways may do double duty as thoroughfares and also as fire trails, according to co-operative plans being worked out. The recent range and grain fires in Yolo county exacted a damage of more than \$1,000,000, besides resulting in a heavy loss to wild animal life, Fred G. Stevenot, State Director of Natural Resources, told the Governor's Council.

A report that already this season there have been 335 field and forest fires in state-patrolled areas, turned the Council into a discussion of methods of reducing the number of blazes.

Governor C. C. Young named a committee, consisting of Stevenot, Bert B. Meek, Director of Public Works, and G. H. Hecke, Director of Agriculture, to make a study of the situation.

Informed that at least 60 per cent of the fires have their origin along the highways, the Governor particularly suggested to the committee that they investigate the possibility of inducing insurance companies to make rate adjustments to farmers and other land owners who take precautions to protect their crops against fires spreading to their property from the highways.

"Be What You Is"

Don't be what you ain't;

Jes' be what you is,

'Cause if you is not what you am,

Den you am not what you is;

If you is jes' a little tadpole,

Don't try to be a frog;

If you is jes' de tail,

Don't try to wag de dog.

You can always pass de plate

If you can't exhort and preach;

If you is jes' a pebble,

Don't try to be de beach.

Don't be what you ain't,

Jes' be what you is,

Cause de man that plays it square

Am gwine to get his.

It ain't what you is has been,

It's what you now am is.

—Badger Highways.

\$550, by lowering each bent separately. Traffic was not interfered with in any way, and the traveling public was unaware that anything was being done to the structure.

New bids received for the placing of the wheel guard and guard rail justified the action of the district in rejecting the original bids and doing part of the work by force account. With the lowering feature eliminated, better prices were obtained for the placing of the guard rail and wheel guard. The lowest original bid was \$12,559.60, while the lowest bid for the placing of the guard rail and wheel guard alone was \$9,781.20, which, added to the cost of lowering, \$550, makes the total cost of the job \$10,331.20, effecting a total saving over the original low bid of \$2,228.40.

The Division of State Highways; Its Powers and Responsibilities

From the California Blue Book, 1928.

ALL POWERS AND DUTIES formerly granted to or imposed upon the California Highway Commission, except those enumerated below, have been transferred to the Department of Public Works and are exercised through the Division of Highways.

The duties retained by the California Highway Commission are briefly as follows:

The power to alter or change the route of any state highway and to abandon any portion thereof, when in the opinion of the Commission such alteration, change or abandonment shall be necessary or advisable; the power to abandon any lands or parts thereof which have been taken or acquired by the state for highway rights of way; the power to designate the fund or funds for the construction of highways into which federal aid money shall be placed; except as may be otherwise provided by law, the power to select, adopt and determine the routes for new state roads and highways and to allocate moneys for the construction or repair of the various roads and highways under the jurisdiction of the Department of Public Works and to determine in each case the maximum sum of money that shall be made available therefor and to conduct preliminary surveys for the determination of the advisability of including in or excluding from the state highway system any road, or portion thereof (provided that not more than one-half of the cost of any such preliminary survey shall be paid from state funds available for such purposes); the Department of Public Works may not take property by eminent domain until the California Highway Commission shall have passed a resolution declaring the public interest and necessity require such acquisition.

The powers and duties of the Division of Highways may be summarized as follows:

1. To take and have full possession and control of all roads and highways which have been declared and adopted state roads and state highways and all state roads and state highways which may hereafter be acquired or constructed.

2. To acquire rights of way, subject in case of eminent domain to the authorization of the California Highway Commission.

3. To maintain all traversable roads which now are or that may be hereafter included in the state highway system.

4. To do any and all things necessary or proper for the erection, construction, maintenance, management and control of all roads, highways, and other properties which are now or hereafter may be placed under its control, including the construction and maintenance of detour roads, and subject to the Depart-

ment of Finance, the purchasing, leasing, renting or otherwise obtaining all tools, implements and supplies which it shall deem necessary or proper for the performance of the duties imposed upon it by law. (Political Code 365d.)

5. To cause to be prepared and to approve all plans and specifications for all work done under its direction.

6. To determine the kind, quality and extent of such work.

7. To direct whether any such work shall be done by contract, in whole or in part, or by day labor in whole or in part, and, after the approval of the plans, specifications and estimates, if, in its opinion the acceptance of any bid or bids shall not be for the best interests of the state, or if, in its opinion the acceptance of any further bids, after the rejection of all bids submitted, shall not be for the best interests of the state, the division may direct that the work or improvement be done upon a day labor basis.

8. The full control of such day labor work is placed under the Department of Public Works and the department or a division may do all things necessary to properly carry out the work.

9. To let any subdivision or unit of said day labor work by contract upon informal bids.

10. When it appears from the plans, specifications and estimates of cost that the cost and expense of doing any construction, reconstruction, alteration, maintenance, repair or other work authorized to be done by or under the direction of the department, will not exceed fifteen thousand dollars, the director may direct that said work be done under contract awarded to the lowest possible bidder or bidders upon public notice. (Political Code 365e.)

11. In the name of the people of the State of California, to condemn, subject to the approval of the California Highway Commission, or to purchase or receive by donation or dedication or lease any right of way, rock quarry, gravel pit, sand or earth borrow pit, land necessary or proper for offices, shops, storage yards, lands adjoining or near such highways for parks, and also lands and trees within three hundred feet on each side of the center line of any state road or state highway

for culture and support of trees, when in the judgment of said commission the acquisition of said lands and trees, or either, shall be for the benefit of a state highway in aiding in the maintenance and preservation of the road-bed thereof, or aid in the maintenance of the attractiveness or the scenic beauties thereof, and likewise acquire lands for the construction and maintenance of drainage ditches in connection with the highways, also all other lands which said commission shall deem necessary for the construction, use or maintenance of state highways.

12. To acquire, construct and maintain stock trails, paralleling and adjoining or near any state highway in such portions of the state as said commission shall deem necessary or proper. (Political Code 365f.)

13. To make such investigations as will put at the service of the state the most approved methods of highway improvement.

14. To compile statistics relative to the public highways of counties and municipalities.

15. To cause to be prepared plans, specifications and estimates for the repair and improvement of highways and bridges, also act as the consulting engineer for any county, road or boulevard district or division, or municipal authorities, when requested.

16. To investigate and determine various methods of road construction adapted to different sections of the state, as to the best methods of construction and maintenance of highways and bridges and to make such experiments relative thereto as deemed expedient.

17. To call upon any state, county or municipal official to furnish any information contained in his office which relates to, or is in any way necessary to the proper performance of the work of said division.

18. To obtain and pay for insurance protecting said commission and individual members thereof, the state highway engineer and the various assistants and employees of said commission and engineer, all while on state business, against loss or damage because of injury to person or property of others by said insured while driving any truck or automobile and to pay the premium on such insurance.

19. To prepare biennial reports relating to road and highway work which are submitted to Governor thirty days before each session of the legislature. (Political Code 365h.)

20. To have jurisdiction of cooperative highway work to be engaged or existing in by the state with the United States government, subject to the authority of the California Highway Commission to allot funds. All plans, estimates and specifications of road

Gasoline Taxes For 1928 Show 5.58% Increase

Thirty-two million dollars will be the 1928 return from the three-cent gasoline tax in California!

This is the estimate by the State Board of Equalization which announces that the quarterly return on the tax for the last quarter broke all records.

The total receipts for 1927 were \$24,443,137. The additional cent of tax did not go into effect until July 29 of last year.

For the months of April, May and June, the tax levied against gasoline distribution companies in California amounted to \$8,477,293.14, an increase of \$3,124,699.10 over the assessments for a corresponding quarter in 1927 and slightly over \$1,000,000 more than was collected for the preceding quarter.

While the heavy increase was largely due to the enforcement of the additional 1 cent gasoline tax, there was an actual gain of 5.58 per cent in the gas consumption in the state as compared with the second quarter of 1927.

Oil companies in the state distributed 285,430,743.7 gallons in the three months' period against 270,333,079.2 gallons for the same months last year.

Figures compiled by the state board indicated that the rate of increase in gasoline consumption in the state apparently is slowing up. For the first six months of 1927 the gain in consumption over the first six months of 1926 amounted to 14.31 per cent, while the half year gain of 1928 over 1927 has been but 9.63 per cent.

"Age is a quality of mind.

If you've left your dreams behind,

If Hope is cold,

If you no longer look ahead,

If your ambition's fires are dead,

Then you are old!

But—if from Life you take the best,

If in Life you keep the Zest,

If Love you hold,

No matter how the years go by,

No matter how the Birthdays fly,

You are not old!"

—Selected

work shall be approved by the commission and said commission shall have full powers to determine the kind, quality and extent of such work. (Political Code 365i.)

Aids in Traffic Control on State Highway System

There is every evidence that the state motor vehicle department is being operated in a highly efficient manner under the direction of its present chief, Frank G. Snook, says the *Motor Carrier*. Aiding in this efficiency is the system of bulletins which Snook sends out to the many branch offices, inspectors, captains and traffic officers as well as to automobile clubs.

These bulletins acquaint the personnel with any available facts concerning stolen machines or fugitives known to be traveling in automobiles; answer questions which may arise as to enforcement of motor vehicle regulations, and detail the numerous auto accessories which have been approved, and the regulations concerning them.

Chief Snook recently announced that the license plates for 1929 will be dull black with the numerals in bright orange, tests by the Bureau of Standards having determined this contrast to be of highest visibility. Borders have been eliminated on the plates for next year as reducing visibility. The steel will be of 24 instead of 26 gauge to prevent bending or cracking.

The system of numbering has been changed to keep the numerals down to six, with the use of 20 letters from the alphabet, thus allowing 2,300,000 number variations. The digits will be grouped by twos and dividing hyphens will be vertical instead of horizontal, another aid to eye and mind.

The painstaking thoroughness with which the selection of the new type of plates has been made is typical of the entire administration of the motor vehicle department. Every user of the state's highways, whether private or commercial, has good reason to feel indebted to the department for the innumerable ways in which it is policing the roads, facilitating traffic and helping to maintain a high degree of safety.

Recognition of the excellent work being done by the department under Snook's administration was given at the recent convention of the Municipal Traffic League held in San Francisco, which adopted the following resolution:

"Whereas the Division of Motor Vehicles has adopted for the year 1929 a license plate for motor vehicles larger in size and with increased visibility of approximately 200 per cent over previous license plates, and with

improved color combinations thus providing for more ready identification of motor vehicles in the event of accidents and violations of law, now therefore

"Be it resolved that the Municipal Traffic League commend Colonel Frank G. Snook and the Division of Motor Vehicles for its action in adopting such improved and more readily visible license plate for motor vehicles in the State of California."

Recreational Highway Policies are Announced

Commenting on the proceedings of the eighth annual conference on state parks held in San Francisco, the *Stockton Record* said:

"One of the most significant addresses of the convention was made by B. B. Meek, director of the California Department of Public Works, whose subject was 'Building of Parks and Forest Roads.' The speaker said that roads could be divided into two classes—commercial and recreational. On commercial highways the director was quite willing that the engineers should dictate their ideals—straight line even grades, no curves. Recreational highways, however, should be laid out to take advantage of scenic and historic spots.

"The speaker referred to the southern California beach situation and declared that his department, in running new lines for highway paralleling the ocean front, would insist that the intervening narrow strip between the highway and the beach be secured and dedicated to public use. Furthermore, he said, legislation would be sought at the next session of the legislature empowering the state highway commission to acquire beach strips in connection with ocean highway rights of way in order that scenic values might be preserved for all time and made available to the general public."

BRIDGES ON CALIFORNIA STATE HIGHWAYS

(Continued from page 4.)

after a contract is let are very important, and it will invariably save considerable money although adding slightly to the cost of preparation of the plans.

When all of the foregoing is properly complied with, it is only the first step, for in order to get a good bridge it is necessary to construct it properly which requires rigid inspection and proper testing and placing of materials.

IDEAL OF GOOD BRIDGES

It is the hope of the bridge engineer that the finished structures will be durable, pleasing in appearance, conform to the canyon or stream; so that both layman and engineer will gain the impression that bridge construction is being kept abreast with building of modern highways.

Cooperation Wins Contractors' Praise

[From the *California Constructor*.]

HIGHWAY contractors affiliated with the Associated General Contractors of America have been greatly pleased with the cooperative spirit shown by State Highway Engineer C. H. Purcell and the prompt way with which Mr. Purcell considers the suggestions made by contractors.

Recently four requests were made upon the highway department by contractors as follows: First, that monthly estimates be made promptly upon the 25th of the month and include all work up to the 24th of the month; second, that monthly progress payments be made not later than the 10th of the calendar month; third, that final payment be made promptly on the 35th day after the completion and acceptance of the work; fourth, that certified checks which accompanied bids of other than the lowest responsible bidder be returned after the opening of bids.

Engineer Purcell has arranged definitely to have the estimates and payments made in accordance with the first three requests and with regard to the last request Mr. Purcell writes as follows:

"Would advise that your request has been given careful consideration and arrangement made whereby in lieu of the present plan of retaining the certified checks of the three lowest bidders, only the checks of the two lowest bidders will be retained pending award of contract.

"The balance of the checks will be returned not later than the day following the opening of bids. Upon award of contract the check of the unsuccessful bidder will be returned to him, and upon advice of the approval of the contract by our attorney the check of the successful contractor will be returned to him.

"I hope that this plan will meet with favor by contractors of the state."

Warns Against Low

Proposal Checks

There seems to be some misunderstanding among highway contractors regarding the amount of the check required with proposals submitted to the Department of Public Works, Division of Highways, State of California, according to C. H. Purcell, State Highway Engineer, who writes as follows:

"Your attention is called to recent bids received for state highway construction work wherein several

HIGHWAY COMMISSION HELPS BEAUTIFY STATE

The California Highway Commission should receive a medal for the Preservation of the Natural Beauty of the State, in the opinion of L. L. Norris of the National Automobile Club, after an extensive trip over many gravel roads throughout the state, which have been oiled.

It is most noticeable in driving through those sections where the roads have been oiled, that the ferns, shrubs, trees and flowers are much more beautiful, as they are not covered with a gray coating of dust, but instead, retain their natural shades of green and other colors.

New Order Governs Heavy Hauling Permits

"MOVEMENT of heavy construction equipment over the state highways in the past year has become so great that it was felt necessary to limit this movement in order to protect the highways," declares C. H. Purcell, State Highway Engineer. In this respect Mr. Purcell issued a circular letter as follows:

"The movement, under permit, of heavy construction equipment such as shovels, cranes, etc., over state highways is becoming so great in certain districts that it is felt a uniform limit should be established.

"In the future, permits are to be issued for movement of such equipment only over sections of the highways where railroad transportation is not available for freight shipments. This applies to loads of equipment the gross weight of which exceeds the 22,000 or 34,000 pound limit as specified by the Motor Vehicle Act."

bidders have submitted checks insufficient of 10 per cent of the total bid, two of whom would have been low and no doubt would have been awarded the contracts.

"Section 2, paragraph f, of our Standard Specifications dated July, 1927, reads as follows: 'Each bid is to be presented under sealed cover and shall be accompanied by cash, a certified or cashier's check made payable to the Secretary, California Highway Commission, for an amount equal to at least 10 per cent (10%) of the amount of said bid, and no bid shall be considered unless such cash or check is enclosed therewith.'

"The special provisions for each particular project shows in detail the engineer's estimate of quantities, which is the basis to be used in figuring the total bid. In the case of alternate item or items wherein it is specifically stated in the special provisions that only one practice will be used, the certified check can be based on the lowest of the two alternatives."

Wayside Refreshment-Stand Campaign

HIGHWAY OFFICIALS of California are greatly interested in the campaign for the improvement of wayside refreshment stands now being conducted in New York.

This campaign, consisting of a series of four competitions, was initiated by Mrs. John D. Rockefeller, Jr., who contributed an initial amount of \$7,000 to be applied, through the medium of the Art Center of New York and the American Civic Association of Washington, D. C., toward bettering the appearance of the roadside stands which, through ugliness of conception or carelessness of construction, are beginning to menace the beauty of our highways.

An additional contribution of \$10,000 was made by the Adolf Gobel Company for the support of these competitions.

In the initial contest, which was concluded December 15, seven prizes were given for photographs and plans of the best stands already in existence. Awards were made to the following:

(1) "Pinkie's Pantry," \$300, owned and operated by Norma Bamman, 2704 Park avenue, Plainfield, N. J.; (2) "The Bee Hive Cabin," \$200, George A. Parker, 34 River street, Hoosick Falls, N. Y.; (3) "Young's," \$150, W. J. Young, Ontario, California; (4) "The Hut," \$125, Helen Dana, 4761 Morena boulevard, San Diego, California; (5) "Mott's Taverns," \$100, H. E. Meinhold, 502 West 25th street, N. Y.; (6) "The Cabin," \$75, Louise Jacques, Auburn, Kings County, Nova Scotia; (7) "Rio Del Mar Service Station," \$50, Mrs. Harrison N. Lusk, Aptos, California.

The second competition, which was architectural in character, was concluded March 15 and offered prizes for the best original designs of stands which will improve the present conditions. Ten awards, five for stands without gas stations and five for stands with gas stations, were made, the amounts ranging from \$500 to \$100 in each group.

The basis of the awards was:

1. Fitness of the design as a whole to meet the needs and spirit of the problem.
2. Esthetic merit of the design.
3. Excellence and ingenuity of plans.
4. Practicability and economy of construction.

The third competition, which has just been announced by the Adolf Gobel Company, is for the purpose of encouraging the building

of stands from information gleaned in the first and second contests. *\$100 each will be paid for the first fifteen stands that are built from the prize-winning designs.* Complete plans and specifications of any of the prize-winning stands may be had for the nominal cost of \$20. Requests should be addressed to Secretary of Wayside Refreshment-Stand Competitions in care of the Art Center, 65 East 56th street, New York.

Stands must conform with the prize-winning designs, must be in harmony with the surrounding landscape, and must show good taste and restraint in the use of advertising matter. Photographs of the completed stand, ready for opening, must be submitted to the Art Center, together with the name of the architect whose plan was used, and an estimate of the cost of construction.

The fourth competition will be of the nature of annual awards over a term of years for the good appearance and upkeep of those stands which have been built as a result of the second and third competitions.

TRIBUTE TO ROAD BUILDERS

To the builders of the highways
That skirt the canyon's brink,
To the men who bind the roadbed fast,
To the men who grade and the men who blast,
I raise my glass and drink.
Theirs the great endeavor,
And the deed of high emprise.
For they fight with naked hands
'Gainst forest, swamp and shifting sands,
And the fury of the skies.
To the builders who have fallen,
Whose graves mark out the line,
To the blind, who never more shall see,
To the maimed that halt in their misery,
In silence drink your wine.
For them no crashing volleys,
Nor roll of muffled drums,
Only the roar of the great rock blast
Is their requiem song when the day is passed,
And the final darkness comes.
To the engineers, the wizards,
Whose words brook no delay:
Hearing, the sleeping glens awake,
The snow-plumed hills obeisance make—
And lo! the Open Way!
For them no flaunting banners
When a bitter fight is won;
No cheering thousands in the streets,
These gallant heroes ever meet,
Though dauntless deeds be done.

—Evelyn Gunn.

Appointments Are Announced on Highway Staff

Announcement of appointments to positions in the Division of Highways has been made by C. H. Purcell, State Highway Engineer, as follows:

T. H. Dennis, who has been serving on the headquarters staff as Acting Maintenance Engineer, has been appointed Maintenance Engineer.

Chas. H. Whitmore has been appointed District Engineer of District I, with headquarters at Eureka. Mr. Whitmore was formerly Assistant District Engineer of District IV, with headquarters at San Francisco, and was also Assistant Construction Engineer with headquarters at Sacramento. Mr. Whitmore succeeds T. A. Bedford, who resigned to accept a position in Cuba.

R. E. Pierce and E. E. Wallace have been appointed District Engineers for District X, headquarters, Sacramento, and District VI, headquarters, Fresno, respectively. Both have been serving in an acting capacity.

Subway Is Widened; Traffic Hazard Cut At Small Expense

A considerable hazard to highway traffic has been eliminated on the highway between Ione and Jackson where an old narrow subway under the Amador Central Railroad has been widened at a very moderate expense.

The old structure consisted of a truss on timber foundation and bents with only 14 feet clearance across the highway. A number of accidents occurred here, and when the county board of supervisors agreed to cooperate in the building of a wider structure, plans were made of several different types of construction, the one adopted having six 30-inch I beams on timber bents with concrete foundations, and having a 24-foot clear width across the highway.

The construction was handled by the Tenth District. The county furnished all labor and materials for the concrete foundations. The railroad company furnished labor and materials for the track work and all labor and materials for connecting either side of the subway, and hauled timber and steel over their railroad free from Ione.

The cost to the state for this improvement is \$3,400, which is a very small item.

San Bernardino and Redlands Now Served by New Projects

TWO STATE HIGHWAY reconstruction projects netting over fourteen miles have been completed in the vicinity of San Bernardino and Redlands since October, 1927.

Over nine miles of the Foothill boulevard (San Fernando to San Bernardino) extending westerly from San Bernardino has been widened and resurfaced with asphaltic concrete pavement 30 feet wide. This is the first contract to be completed on this route and is typical of the improvement soon to be extended to Claremont under a second contract.

Nearly five miles of the Los Angeles-Imperial Valley highway has been reconstructed between Redlands and the Riverside County line. The completed road is a Portland cement concrete pavement 20 feet wide. Three-foot salvaged macadam borders were placed along each edge of the pavement.

Both projects can now be traveled with a sense of keen enjoyment. The Foothill boulevard, formerly a highway of the straight and narrow type, is now impressive for its roominess. The natural ease and safety of driving over the new pavement permits looking to the side and accentuates beauty in the even lines of the highway and the bordering trees and orange groves.

The Redlands project has been transformed from a road with a broken and uneven surface to a smooth concrete pavement. The white strip of pavement can at times be seen for a considerable distance ahead avoiding low hills with easy curves or crossing slight ridges and depressions with neatly finished cuts and fills.

Carl B. Wirsching Resigns

It is with regret that District VIII announces the resignation of Carl B. Wirsching, Assistant District Engineer. Mr. Wirsching leaves the state service to go with the Rock Producers Association of southern California.

Bill tells a friend of his—a beginner at golf—who, when asked how he came out on the first day on the links, replied that he made it in eighty.

"Eighty," ejaculated Bill, "that's really remarkable. Most oldtimers would envy you that score. You'll surely be an enthusiast from now on."

"Yes," said the novice, condescending, "I'm going back tomorrow and try the second hole."

Contractor Solves Problem of Moving Finishing Machine

The operation of the 30-foot asphaltic concrete raking and finishing machine on the recent foothill boulevard project presented some unusual moving problems.

Specially constructed for raking and finishing asphaltic concrete surface mixture for the full width of 30 feet this machine was necessarily heavy. During operation its entire weight is carried on ear wheels running on the side forms as a guide or track. To secure rigidity in the frame of such a wide machine, it is necessary that the transverse members of the frame be rigid steel trusses. Except by driving by its own power on a 30-foot gauge track moving this machine would appear to be a job for special equipment.

The contractor, Mr. Steel Finley, found that the job could easily be done with two of the dump trucks he uses for hauling the asphaltic mixture from the plant to the highway. Operation number one was to roll the machine by its own power on planks laid temporarily under the wheels to a position parallel with the highway. When the machine was turned to this position, dump trucks were backed to each end of the machine with bodies raised as for dumping material. A heavy chain was passed across the rear end of each dump body and fastened to the end of the machine. The dump bodies were then lowered to hauling position. Due to the slightly forward position of the hinges this caused a raising of the extreme rear end of the dump bodies thereby lifting the finishing machine from the ground. The remainder of the moving was a matter of team work of the two truck drivers, one driving forward and the other backing, both moving at the same speed. At the end of the move, the operation was reversed and the finishing machine returned to its working position across the highway.

The machine was moved a number of times during the progress of the contract. It was first moved from the railroad station to the San Bernardino end of the job. A few days later it was picked up and moved across Lytle Creek bridge, later it was moved from Rialto to the westerly end of the contract, later over an exception at the Pacific Electric Railroad crossing, and finally it was moved back to the railroad yards to be reshipped.

THE JULY TRAFFIC COUNT

(Continued from page 8.)

Route 13. Salida to Sonora

Station	July, 1927		July, 1928	
	Sun. 17	Mon. 18	Sun. 15	Mon. 16
East of Salida, at McHenry's Ave. to Modesto	1,358	1,123	1,385	1,260
Oakdale, west of city	1,368	1,118	1,496	1,179
Sonora, south of city	1,890	1,089	2,304	1,740
Sonora, east of city	2,321	1,226	1,850	1,174

Route 14. Albany to Martinez

Albany, at county line	22,683	14,944	21,947	13,830
Junction county road to Richmond	17,365	10,041	18,329	10,657
Junction Franklin Canyon road	9,473	4,466	9,762	4,631
Crockett, 1 mile south of city, junction county road to Crockett	2,656	1,550	1,980	1,308
Martinez, west of city limits	1,595	661	1,319	692

Route 15. From Route 1 near Calpella to Grass Valley

Ukiah, north at junction route 1	1,049	641	889	620
Mendocino and Lake County line	~ 545	315		not taken
Near Venada, junction county road to Bartlett Springs	102	64	167	116
Williams, west of city	381	477	435	494
Williams, east of city	471	431	458	431
Colusa, east of city	1,197	896	802	673
Marysville, east of city	766	575	1,054	684
Grass Valley, west of city	508	370	575	322

Route 16. Hopland to Lakeport

Hopland, at junction route 1	755	631	776	808
Lakeport, south of town	830	778	993	688

Route 17. Roseville to Nevada City

Roseville, east of city	3,549	2,088	3,761	2,139
Auburn, south of city at S. P. R. R. crossing	3,430	2,188	3,367	1,978
Auburn, north of city at junction County Club road	1,565	885	1,447	766
Grass Valley, south of city	1,651	859	1,405	678
Nevada City, south of city	1,598	1,197	1,599	1,236

Route 18. Merced to El Portal

Merced, at intersection county road and 21st street	2,341	2,146	2,684	2,269
Merced, 12 miles east at junction county road to Le Grand	1,069	1,009	1,847	1,186
Mormon Bar, at junction county road to Mormon Bar	2,231	1,670	2,413	1,477
Briceburg, Bear Creek bridge	1,853	1,363	1,663	999

Route 19. From Route 9 West to Claremont to Riverside

Between Pomona and Ontario, at Chino cross roads	6,026	3,559	9,894	6,872
Los Angeles County line, east limits of Pomona	11,835	6,922	10,677	7,071
Riverside, west of city near Santa Ana River bridge	7,165	6,215	6,554	5,500

Route 20. Route 1 near Arcata to Redding

Arcata, north of city at junction route 1	704	618	1,647	831
Weaverville, 3 miles south	144	132	122	133
Between Redding and Tower House	197	176	310	208

Route 21. Route 3 near Richvale to Quincy

Oroville, east of city	1,208	642	1,119	707
Quincy	351	319	312	269

Route 22. San Juan Bautista to Route 32 via Hollister

San Juan Bautista, south of city at junction route 2	2,269	1,463	2,662	1,525
Hollister, junction route 32	971	580	1,130	614

Route 23. Saugus to Bishop

Saugus, junction with route 4	3,661	2,230	4,733	2,669
Lancaster, junction with route 59 to Neenach	1,216	906	1,410	1,188
Freeman, 1 mile north, junction to route 57	361	287	380	222
Lone Pine	1,308	1,166	887	813
Bishop, half mile north junction county road north and county road easterly	1,163*	889	1,200	895

Route 24. Route 4 near Lodi to Valley Springs

Lodi, junction route 4	1,333	1,102	1,548	1,180
Bet. San Andreas and Valley Springs	769	405	767	359

* 24 hour count.

Route 25. Nevada City to Downieville

Station	July, 1927		July, 1928	
	Sun. 17	Mon. 18	Sun. 15	Mon. 16
Nevada City, north of city-----	361	264	382	246
Comptonville, north of city-----	260	211	289	230

Route 26. San Bernardino to El Centro

San Bernardino, S. of city at N. end of Santa Ana Br. county rd. to Colton-----	3,456	2,639	3,234	2,182
At intersection Mt. View Ave., west of Redlands-----	2,270	1,593	3,101	2,001
Beaumont, junction Jack Rabbit Trail-----	3,708	1,178	1,836	1,282
Canby, south of city at junction county road to Thermal and Mecca-----	885	724	917	1,123
Westmoreland at railroad crossing-----	1,136	1,162	1,529	1,432
Brawley Junction, south west of city-----	2,383	2,998	1,793	1,926
El Centro, west of city, junction Rt. 12-----	2,226	2,432	2,240	2,477

Route 27. El Centro to Yuma

El Centro, east of city at junction county road north to Brawley and south to Calexico-----	2,125	2,081	1,711	2,226
East of Holtville-----	1,122	1,085	1,102	1,504
Sand Hills maintenance station-----	380	275	492	396
Yuma, at S. D. A. plant quarantine station-----	2,115	1,541	1,922	1,666

Route 28. Redding to Nevada line via Alturas

Redding, south of city at junction with route 3-----	624	571	527	567
Four miles east of Pittville at maintenance station-----	115	89	142	98
Canby-----	132	135	213	181
Twelve miles east of Alturas at maintenance station-----	162	60	134	78

Route 29. Red Bluff to Nevada line via Susanville

Red Bluff, east at junction route 3-----	411	405	652	599
Susanville, 1 mile west of town-----	961	466	1,130	584
Susanville, 1 mile east of town-----	1,237	1,075	1,236	1,082
Five miles south of Constantia-----	222	124	191	143

Route 31. San Bernardino to Jean

San Bernardino, north of city at junction Mt. Vernon and Highland Aves.-----	2,463	1,369	2,247	1,313
South of town limits of Victorville-----	1,229	994	1,400	1,069
Southwest town limits of Barstow-----	640	645	822	676
Nevada state line-----	143	135	212	234

Route 32. Route 2 near Gilroy to Route 4 near Califa

Hollister, junction with route 22-----	1,634	1,015	1,616	900
Pacheco Pass at Merced-Santa Clara County line-----	1,565	943	1,809	998
East of Los Banos at junction county road to Dos Palos-----	705	483	1,624	1,276
Califa-----	876	629	870	695

Route 33. Paso Robles to Route 4 near Bakersfield

Paso Robles, east of city-----	1,379	1,428	1,297	1,317
Paso Robles, ¼ mile east of city-----	888	951	888	901
Lost Hills, intersection of Main St.-----	346	375	405	398

Route 34. From Route 4 near Arno to Pine Grove

Twin Cities, junction route 4-----	569	308	375	287
West of Ione, junction county road to Michigan Bar-----	324	142	230	111
North of Jackson, junction route 65 to Placerville-----	796	514	915	628
Pine Grove, east of town-----	453	230	503	192

Route 37. Auburn to Nevada line near Verdi

Auburn, east of city-----	2,190	1,455	2,276	1,425
Colfax, east of city, junction Nevada City road-----	1,493	934	1,729	968
Truckee, east of city, junction route 38 to Nevada-----	1,377	820	949	586

Route 43. San Bernardino to Big Bear Lake

Foot of Waterman grade-----	2,169	686	2,957	831
Pinecrest, junction county road to Arrowhead Lake-----	838	244	1,204	309
Running Springs Park, Junction City Creek road-----	757	324	1,032	371
West end of bridge over Big Bear dam-----	699	581	1,391	523
One mile from end of route 43, junction county road to Pine Knot-----	442	328	468	257

Route 44. Boulder Creek to Redwood Park

Boulder Creek at park line-----	2,010	1,106	2,126	1,259
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Route 47. Orland to Chico

Station	July, 1927		July, 1928	
	Sun. 17	Mon. 18	Sun. 15	Mon. 16
Orland, junction with route 7-----	374	306	698	652
Chico, west of city-----	1,261	999	1,458	1,287
Hamilton City, at Union High School-----	337	229	850	515

Route 48. McDonalds to Wendling

McDonald, junction route 1-----	261	200	275	316
Wendling, 3 miles west of town-----	615	259	427	359

Route 49. Calistoga to Lower Lake

North of Calistoga at foot of grade-----	1,049	528	1,320	526
Lower Lake, junction Kelseyville and Lower Lake road-----	507	291	527	383
Middletown, junction Cobb Mtn. road-----	1,273	599	1,615	881

Route 51. Santa Rosa to Schellville

Santa Rosa, east of city-----	3,751	2,532	4,160	2,458
Schellville, junction route 8-----	1,714	620	2,487	878

Route 52. Aito to Tiburon

Belvedere, junction-----	1,416	779	2,205	1,060
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Route 53. Fairfield to Lodi

Denverton, at overhead crossing-----	572	300	671	379
Rio Vista bridge-----	1,580	1,093	1,565	1,177
Walnut Grove-----	558	384	518	391
Thornton, intersection county road-----	1,367	796	1,398	946
Lodi, north of city-----	1,540	951	1,258	1,101

Route 55. San Francisco to Spring Valley Dam

At swimming pool-----	10,395	2,031	9,341	2,486
Junction with county road to Colma-----	5,941	752	5,869	1,166
Junction with county road to Belmont at earth dam-----	3,745	536	4,020	644

Route 57. Santa Maria to Freeman via Bakersfield

Santa Maria, north of city at junction route 2-----	193	88	203	96
At San Luis Obispo-Kern County line-----	268	107	276	87
Maricopa, west of city-----	846	543	535	353
Bakersfield, 1 mile east of city limits-----	2,763	2,393	2,116	1,922
Bakersfield, 10 miles east at country club road-----	1,039	244	1,098	192
Bodfish, at intersection route 57 with county road to Caliente-----	229	109	255	105

Route 58. Mojave to Topoe

Barstow, north of city at junction county road-----	235	221	266	226
Daggett, junction Arrowhead trail-----	274	297	647	517
Vicinity Amboy-----	217	177	305	270
Needles, west of city limits-----	506	494	611	471

Route 60. El Rio to San Juan Capistrano

Santa Monica, 500 feet west of Santa Monica Canyon-----	15,486	7,213	*27,535	*7,421
Lorita-----	11,222	6,053	10,261	6,842
Seal Beach, at Los Angeles-Orange County line-----	18,889	8,500	20,786	8,516

Route 63. Big Pine to Oasis

Big Pine, junction route 23-----	66	101	68	90
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Route 64. Mecca to Blythe

Desert Center-----	53	53	84	58
Blythe, S. D. A. quarantine station-----	90	55	137	119

Route 65. Auburn to Sonora (Mother Lode Highway)

Auburn to wire bridge-----	404	189	192	111
Placerville, northwest of city, junction Georgetown road-----	210	168	192	131
El Dorado, south of city-----	160	116	260	193
Central House-----	293	144	488	392
North of Jackson, junction route 34-----	625	554	853	813
South of San Andreas, at Sheep Camp-----	843	561	964	611
West of Sonora, junction county road south to Jamestown-----	no count			

Route 66. Manteca to Route 5 near Mossdale School

Mossdale, junction route 5-----	3,085	2,094	5,350	3,671
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Route 68. San Francisco to Burlingame

San Bruno, junction with route 2 to San Francisco-----	8,175	4,355	3,685	2,581
North city limits of South San Francisco-----	7,870	4,744	10,006	5,872

Route 71. Crescent City to Oregon line

Crescent City, north of maintenance yard 1,983-----	572	902	872	
At Oregon-California line-----	218	168	318	257

* Taken at different station, but comparable.

THE DISTRIBUTION OF STATE HIGHWAY MONIES

(Continued from page 6.)

Covering as wide a geographical area as does the work of the Division of Highways: involving as many different projects as it does, and employing as many people scattered over the whole state as are engaged in building the California highway system, the accounting methods by which highway money is disbursed become of great importance.

The rule is that no money can be spent without written authorization given in advance of its expenditure. This rule is severely enforced. Allotments for all work are set up. If for any reason an allotment proves insufficient a supplementary authorization must be secured before the work can be continued. In this way disorganized expenditure of state highway money is avoided and an immediate check is maintained upon all persons responsible in its disbursement.

THE BUDGET

The most radical change in highway spending methods in the history of the California system was undoubtedly the inauguration of the budget system by Governor Young. Through the budget the people are informed of where and how highway money is to be spent in advance of its actual disbursement. At every legislature a complete budget of recommended highway expenditures, along with other proposed expenditures of the state, is submitted to that body. The budget system is a proper recognition of the change in highway financing from the "stop-go" bond issue plan of highway financing to the "pay-as-you-go" method now in vogue. The budget enables the people to "sit in" on the expenditure of highway money just as they "sit in" in raising this money. The budget is a duty and a trust that both the state administration and the Department of Public Works takes most seriously.

We have attempted to give a birds-eye view of the limitations imposed by law upon the highway officials and the policies that determine the how, when and where of highway expenditures within the discretion permitted these officials. The record of state highway expenditures in California is that millions of dollars have been spent without taint of graft, or breath of scandal. This is a record of which California can be proud, a record which is a badge of honor to all who have been connected with the work.

State Aiding the Puncture Vine Control

Of interest to the farmer and landowner are the efforts of the Maintenance Department of the Division of Highways in controlling noxious weeds within the highway limits.

Particular attention is given each season to the control of puncture vine. This pest reproduces itself from seed continuously, almost, from the time it starts above the ground. It thrives amazingly during the hot weather and constant watchfulness is necessary to make any headway in its control.

During 1927 the roadsides along 575 miles of the state highways were sprayed once at least and on many miles several applications were necessary.

There are four orchard power spray outfits regularly assigned to this work and a number of small pump outfits for infestations of slight extent. Spray material made of stove distillate, fuel oil, and caustic soda mixed with water is used. The cost of the work in 1927 was \$8,200.

HIGHWAY WORKERS ARE COMMENDED BY SOLANO COUNTY FARM BUREAU

THE SOLANO COUNTY FARM BUREAU

R. F. D., Suisun, California, June 12, 1928.

Mr. R. E. Pierce,
Acting Engineer, District No. 10,
Division of Highways, Strub Building,
Sacramento, California.

DEAR SIR: Several serious fires have occurred recently in the vicinity of Suisun and Fairfield. There was a particularly bad fire on the Leslie Anderson ranch near Cordelia last week. At that time, Mr. C. L. Caine, Foreman of Maintenance District No. 10, brought his highway crew and did exceptionally fine work in helping fight the fire. Mr. Caine and his men stayed until the fire was out.

We wish to commend Mr. Caine for his splendid work and thank him and your department for this assistance.

Assuring you of our appreciation, we are

Very truly yours,

SOLANO COUNTY FARM BUREAU,

ASA L. SCARLETT, President.

AS/KS

IDALHO plans to apply oil on 300 miles of state highways during 1928, concentrating this mileage along the Yellowstone Park Highway, the Old Oregon Trail, and the North and South Highway. Contracts will be let for most of this work.

Pioneer Compares Stage Driving with Modern Bus Ways

By ALMON COONROD, Engineer, District Eight,
Division of Highways.

The responsibility of stage drivers is increasing. The busses are being built larger with more capacity and the traffic on the highways is increasing the chance of collision or injury to passengers many fold. Such was the gist of a conversation which started between the writer and the driver of a modern automobile stage en route over a modern highway in California. It happened that I occupied that part of the front seat next to the driver's seat. An hour or more would pass before the next stop. No sign hung on the windshield to forbid talking to the driver and merely watching the road ahead had become monotonous.

The subject seemed to amuse the driver, a broad smile crept over his face and then he began. "You should hear what the old gentleman who sat next to me a few days ago had to say. I had boasted somewhat of the number of life lines I held in my hands as I held the old bus between the line of passing automobiles and the right-hand edge of the pavement. The old man gave me the laugh and began as follows: 'In my day stage driving was the most skilled of professions. To get the job the driver must serve an apprenticeship for a number of years. He must know the roads as well as men and horses and must be highly trained in the use of rawhide ropes and whips and firearms.

Along the stage lines at convenient distances were stations where supplies were kept and there was board and lodging for men and horses.

Each day at noon the stage came to a sliding stop before one of these stations. The stage driver immediately took command of the entire station. He sat like a statue in his top story seat until the attendants had taken the horses. The passengers remained in their seats until the stage driver had dismounted.

He walked straight to the dining room where stood the long table crowded with steaming hot food. The passengers followed, but remained standing until the stage driver was seated.

He sat at the head of the table. The passengers sat quietly and no one tasted food until the stage driver had started eating.

After the meal he arose from the table and walked to the barroom. The bartender filled his glass from his special bottle. The passengers arranged themselves along the bar but no one took a drink until the stage driver had taken his drink.

As he passed out the door of the station one attendant helped him put on his coat while another gave him his hat and a big black cigar. He walked to the stage where the fresh team was waiting, but the passengers did not take their seats until the stage driver was in his seat.

The horses had been hitched to the stage blindfolded and each animal was held by the bit by an attendant. To insure an even start the less spirited beasts were cudgeled.

The stage driver sat still in his seat until the lines were handed to him by an attendant. At a warning signal the passengers settled in their seats and grasped the leather hand holds. Then by cracking his whip and releasing the break with the heel of his boot, the stage driver gave the signal for the start. The blind-

Study Is Made of Toll Bridges on Roads of Nation

TOLL BRIDGES numbered 233, of which 191 were privately owned in operation in the United States January 1, 1928, according to a survey recently completed by the Bureau of Public Roads, Department of Agriculture.

At present, there are 29 new toll bridges under construction and 163 proposed for construction. Included in the number proposed for construction are all projected bridges regarding which some definite step has been taken, such as the filing of application for franchise or organization of a company to finance construction.

Of the 233 toll bridges now in operation, 86 were built within the last 10 years, according to the survey. If the bridges now under construction or proposed are completed, and none of the existing bridges is freed in the meantime, the number of toll bridges in the United States will nearly double in a few years.

BRIDGES ON FEDERAL-AIDED ROADS

The study also shows that the majority of toll bridges in the country are on roads which are part of the Federal-aid Highway system, the reason being that this system of 186,000 miles includes the most important state and interstate roads, which are consequently the most heavily traveled roads in the country. Of the 425 toll bridges in operation, under construction, or proposed at the beginning of the year, 217 or more than half were on the Federal-aid systems, 60 were on roads included in state highway systems but not in the Federal-aid system, and 148 were on other roads.

GRANTED LEAVE OF ABSENCE

A leave of absence for three months has been granted E. Forrest Mitchell, secretary of the California Highway Commission. During his leave of absence, Mr. Mitchell will continue the work he carried on during his vacation, when he was in charge of the Hoover state headquarters in San Francisco.

folded were dropped from the eyes of each animal and the stage lurched forward on its rocking journey along the dusty trail.

"Now," said the old gentleman "I'm not saying a word about fighting Indians or holdup men or anything about the roads in those days, but until the stage was stopped at the next station the driver was responsible for himself, the express and mail on board as well as all the passengers."

"There," said the old man, pointing at an object beside the road, "that stone marks the grave of one of the early stage drivers."

"I looked at the stone," said the modern stage driver, "and saw it was only a mile post but I did not wish to remind the old gentleman of his failing eyesight so I did not tell him of his mistake. After all who knows but that the old timers buried their gallant stage drivers a mile apart and marked their graves with milestones. It is a positive fact, however, that the man holding the leather straps, a steering wheel or the throttle of a locomotive is responsible for his passengers."

Puzzling Drainage Problem Solved on Contra Costa Road

The question of drainage is a most vital one in highway construction and maintenance.

On the highway between Oakland and Martinez it was found necessary to build a portion of the road near Rodeo over an old reservoir. The bottom of this reservoir was silted up and a fair-sized creek, Rodeo Creek, had left its former course and eaten a way over to the highway which it followed for about a half mile. During heavy storms of 1926-27 and 1927-28 the seepage of water into the silt subgrade softened it until it squeezed out and caused settlement of the roadbed and it was evident that in time this section of road would be totally destroyed.

The problem had been under discussion for some years, with the idea of cutting a new ditch channel to keep the water from approaching the roadbed, but objections from property owners were too great to allow of this solution.

After studying the situation with the idea of building a flume or culvert to carry the water safely over the dangerous section, negotiations were again taken up with the neighboring property owner and an agreement finally reached whereby a new ditch channel was cut parallel to and about 150 feet easterly from the roadbed. This channel is about one-half mile long and it was necessary to cut through a small clay hill.

The work was recently completed by maintenance forces and has satisfactorily relieved the heavy roadside drainage.

Business Frontage and Expected Population

How much business property to plat in new subdivisions and to zone for commercial use in established communities is a question always before subdividers and zoners.

The Chicago Regional Planning Association recently undertook to determine the relationship between population and the amount of business frontage. The Association made measurements in forty cities and villages in the region of Chicago. Thirty-two of the communities measured were medium sized suburbs both residential and industrial, in varying directions and distances from Chicago. Eight larger cities were used.

At each place exact measurements were made of the ground floor store frontage actually in use and the number of stores was recorded under fifteen main classifications.

Approximately 50 feet of business property are in use by every 100 persons in the forty cities and villages measured.

The character of the community (residential or industrial) has little effect on the amount of business frontage in use.

The area covered by the community makes little or no difference in the relationship.

The Association recommends that subdividers and zoning authorities adopt the figure, 50 feet of business frontage for every 100 persons of expected population, as a basis for platting and for zoning business property.

States Show Tendency To Increase Allowable Speed of Auto Traffic

At least ten states increased the allowable speed limit on open highways outside of corporate limits, during the past year. The American Automobile Association gives the following states as having increased their limits:

Idaho—From 30 to 35 miles an hour in the open country.

Indiana—35 to 40 miles an hour.

Iowa—20 to 25 miles per hour in residential district of cities.

Maine—8 to 15 miles at street intersections in built-in areas of municipalities.

Maryland—35 to 40 miles an hour on highways outside of cities.

New Hampshire—25 to 35 in open country and from 15 to 20 miles in business sections of municipalities.

North Carolina—35 to 45 miles an hour in open country.

North Dakota—30 to 35 miles an hour on highways outside of cities.

Oregon—30 to 35 miles per hour.

Washington—From 30 to 40 miles an hour.

Michigan Speed Limit Abolished

The state of Michigan has abolished the speed limit on open highways throughout the state. A new traffic law, which has recently gone into effect, eliminates the previous 35 miles an hour maximum and puts in its place a provision which places upon the motorist the responsibility for driving only at a reasonable and proper speed. This applies only to the highways outside the corporate limits of cities. The new law sets a limit of 15 miles per hour on all highways in the business district and 20 miles an hour in residence and park districts, subject to other speed regulations adopted by local committees.

In Indiana

The forty-mile-an-hour legal maximum speed has been adopted in Indiana under a new vehicle code. It also provides that no person other than a police officer in uniform is permitted to interfere with traffic.

Can Not Advertise Speed

Auto salesmen in the state of Washington are forbidden to refer to the speed of their cars in advertisements. This law has been passed with the hope it would decrease reckless driving.

VIRGINIA—During the past year the state used an allotment of \$1,250,000 for improving secondary roads.

State Highway Work in the Counties

ALAMEDA COUNTY

Ariss-Knapp Company of Oakland have been busily engaged during the past month in completing oil macadam pavement between Dublin and Hayward. Construction on this project began during the summer of 1927 and has therefore extended through the heavy winter season, which necessitated closing down operations for long periods at a time. Grading work was, however, carried on between storms and at such locations as the work would permit where it did not interfere with the movement of traffic. Some small line changes were completed but not until the early spring of this year did the major heavy grading work begin and rough subgrade completed for placing of the bituminous macadam pavement. Both grading work and rock surfacing have been carried on continuously of late and the roadbed was completed to a state where it was permissible to throw the entire road open to both east and westbound traffic prior to July 4th. The contractors had worked with this in mind knowing that the heavy holiday traffic would traverse their contract and it left little for them to do other than to force to an early completion. The contract will not be completed within the original allotted time but will be extended for a short period in order to allow of completion of shoulders, side roads, cleaning out of ditches, culverts and other work pending final acceptance, which it is hoped will be made sometime the forepart of August.

The construction of three reinforced concrete bridges across Hollis, Palomares and Cull creeks has permitted Ariss-Knapp Company to complete the approach fills and paving over these structures. The completion of this unit, together with that section constructed between Dublin and Livermore during the summer of 1927, completes our work during the present biennium in this section of Alameda County.

The entire distance of 16.88 miles is much improved, affording better sight distance and reducing many hazards which formerly existed.

ALPINE COUNTY

A few weeks ago a small replica of the St. Francis Dam disaster occurred in Alpine County when an irrigation dam, known as Crater Lake Dam, located near Hope Valley burst and the flood waters crossed the state highway depositing large boulders and debris of all kinds along the frontage of approximately one-quarter of a mile, making it necessary to build a detour road to take care of travel. This was particularly annoying as it happened on the day we had scheduled for the opening of the Alpine Highway which had but one remaining barrier, the snow drifts on Red Lake Grade. With the aid of the maintenance crews from the Amador County side both the snow removal and the detour road were taken care of and the road was opened on the evening of the day planned for the opening.

Preliminary survey is progressing on Route 23 connecting Markleeville with Route 23 near Coleville, in Mono County.

AMADOR COUNTY

The Alpine Highway has been treated with oil from Pine Grove to Ranger Station, greatly improving this road as no oil had been placed above Dew Drop Inn in previous years.

The contract to G. E. Finnell for grading east of Jackson is nearly complete.

BUTTE COUNTY

Construction of the wooden convict camp for the accommodation of prisoners who will construct the Feather River Highway north of Oroville, was completed in June, and the first convicts were received early in July. Work is now well under way on the grade, and the actual highway will be in evidence from now on.

CALAVERAS COUNTY

State forces are clearing a new right of way at Blacks Springs, removing trees and brush preparatory to asking for bids for the construction of 2 miles of new road to eliminate the Black Springs Grade.

CONTRA COSTA COUNTY

The approaches to the Wilcat Creek Bridge near Richmond, recently completed by Tieslau Bros. of Berkeley, have been oil treated by District IV maintenance forces. The entire work is now completed and open to traffic.

DEL NORTE COUNTY

The contract for producing crushed rock surfacing and oiling 35 miles of state highway, southerly from the Oregon-California line on the Redwood Highway, has been let to the Holdener Construction Company, and the contractors are preparing to immediately set up their crushing plants and begin operations.

On the Roosevelt Highway, bids have also been received for the surfacing between Crescent City and a point 0.7 mile south of the Oregon line. The Holdener Construction Company are also low bidders on this work, and it is expected that they will immediately begin work on this contract also.

John R. Hill was the low bidder for constructing 0.7 of a mile on the Roosevelt Highway, from the Oregon-California line, southerly to connect with the Holdener Contract of surfacing.

H. W. Webber is progressing satisfactorily in the production of approximately 9000 cubic yards of surfacing material to be used in connection with surfacing and oiling of state highway between Crescent City and a point 15 miles southerly.

On the two contracts which have been awarded to J. E. Johnston of Stockton, for constructing approximately 10 miles of state highway between the southerly Del Norte County line and a point 15 miles south of Crescent City, the contractor has moved approximately 24,000 cubic yards of material during the past month and by June first, it is expected that he will have five power shovels working double shift in order that he may complete his work before the winter season. There are only a few points along the Johnston contract which interfere with the present traveled way and therefore, this work will inconvenience the summer tourist traffic very little.

The Holdener Construction Company has the contract for furnishing surfacing and oiling from the Oregon-California line southerly along the Grants Pass road for 35 miles along the Redwood Highway, and are expected to be placing crushed rock on the road by the tenth of July, 1928, from two crushing plants and starting their oiling operations very shortly thereafter.

The Parker-Schram Company, which has the contract for constructing the Smith River Bridge approach 7 miles easterly from Crescent City on the Grants Pass road, has completed the grading operations to the easterly approach to the bridge, and the foundation excavations for the bridge piers are being made.

The grading and surfacing of the 3.9 miles of roadway leading up to the new proposed Smith River bridge is now being completed by the state forces and the Parker-Schram Company. It is expected that three power shovels will be in operation on the section within another week.

Roosevelt Highway, Crescent City north to the Oregon Line. John R. Hill has the contract for grading and surfacing 0.7 of a mile from the Oregon line southerly, and he has started his excavating and constructing of culverts, and it is expected will start his grading operations in the very near future.

The Holdener Construction Company are starting the clearing and grading operations preparatory to the widening and surfacing of the Roosevelt Highway from Crescent City north 21.6 miles.

Redwood Highway, Crescent City south. State forces are making decided improvement in the alignment of the roadway from Crescent City southerly along the steep bluffs of the coast.

J. E. Johnston has two contracts aggregating 10.8 miles in length northerly from the Humboldt-Del Norte county line along the Roosevelt Highway.

The contractor's operations of clearing and grading do not interfere with the traveling public excepting in two or three short stretches, as the new alignment is almost entirely away from the present old county road, which is now maintained by the state. The contractor has five power shovels running double shift on the work, and he intends to complete the work during the present working season.

FRESNO COUNTY

Construction work on the Herndon Bridge over the San Joaquin River has been started by Contractor Carl H. Peterson of Fresno.

Additional equipment has speeded up the work of widening and straightening the highway west of Coalinga on Route 10. This work is being done by day labor under the direction of Foreman O. D. Gaston.

HUMBOLDT COUNTY

Bids are to be received July 18, 1928, for the grading and surfacing of the roadway between Fortuna and Fernbridge, a distance of 2 miles.

The district contract calling for bids on the construction of a change in alignment at the southerly approach to the North Scotia bridge over Eel River are being received July 5, 1928.

The Engelhart Paving and Construction Company are again operating full time on the contract from the northerly Humboldt County line, approximately 6½ miles southerly, and the work is about 75 per cent completed.

W. H. Hauser, who has the grading and surfacing contract for 8.15 miles, Orick northerly on the Redwood Highway, now has his contract approximately 90 per cent complete. Traffic will be carried through these two jobs during the summer but the control system will be used as soon as the quantity of traffic demands it.

Oiling work, both repairing the old work and placing of new oil surfacing, will be in progress throughout the coming month at various points in Humboldt County, between the southerly Humboldt County line and Big Lagoon. On all of this oil work, one of the first considerations is the traveling public and wherever there is any fresh oil through which it is necessary to travel, traffic is under control and is led through the fresh oil by a traffic officer at a slow rate of speed, so that there will be no splashing of the oil on the cars.

The Engelhart Contract, which extends 6.7 miles southerly along the Redwood Highway from the Humboldt-Del Norte county line, is progressing rapidly considering the very difficult situation of dense redwood forests and occasionally heavy summer rain falls which delay the work and impair traffic through the construction at times. The contractor has made a new set up of his rock crushing plant, and is again

producing surfacing and fast getting the road in shape for the use of the public.

The Hauser contract, which extends from Orick northerly along the Roosevelt Highway for 8.1 miles, is practically complete except for a small amount of surfacing and the finishing work.

E. V. Skeels, who has the contract for two small bridges on the Hauser contract section, has completed the driving of the piles and his foundation work is progressing satisfactorily.

Mercer-Fraser Company have just completed erecting the steel for the bridge over Redwood Creek at Orick and will very shortly be placing the concrete floor.

State forces are continuing the oiling of portions of the roadway between Scotia and Garberville, but traffic is not being inconvenienced by this work.

IMPERIAL COUNTY

The Jahn and Bressi contract between El Centro and Seeley on the San Diego-El Centro route is closed down for the summer. The grading and culvert work has been completed and the job has been left in shape to start laying the new asphaltic concrete surfacing the last of September.

The Callahan Construction Company is making substantial progress with their bridge and storm drain contract on the Los Angeles-Imperial Valley highway between the Trifolium Canal and Arroyo Salado Wash. When this section of highway is safeguarded from storm damage a contract for a 20-foot asphaltic concrete resurfacing will be advertised.

KERN COUNTY

Considerable oiling work is being done on the state highways in Kern County and the widening and straightening program on the Kern River Canyon Road is being vigorously followed.

State forces on Route 57, through the Kern River Canyon between Democrat Springs and Hobo Hot Springs, are rapidly eliminating the more dangerous curves. The increasing traffic on this road necessitates a higher standard of alignment. Work is under the direction of Foreman A. Wonacott.

KINGS COUNTY

Shoulders and roadsides from Hanford west to the Fairgrounds have been oiled by state forces to eliminate the dust nuisance, particularly during the county fair.

LASSEN COUNTY

Work is now under way on the treatment of the highway from the foot of Chester Grade to Westwood, by the oil mix process. This will result in a smooth and dustless road for traffic, over a portion which has been quite loose and dusty for traffic during the past several summers. The resurfacing of the constructed highway from Westwood for 2 miles eastward, and from Coppervale to Devil's Corral, is now well under way, and will be completed during August. This will result in a surface which it will be possible to treat with oil early next summer, and this will result in a practically continuous oiled surface from Chester to Susanville.

Oil treatment of the constructed highway from Lassen to Milford, by the mix method, will start about the 20th of July, and will be completed in about a week thereafter. The oiling of this 10 miles of road will make a continuous pavement or oil surface from Susanville to a point near Milford, and will greatly relieve dust conditions on this high speed road.

Bids will be opened on the construction of a graded and surfaced highway from Bieber to Adin this month, and with good weather, this section may be com-

pleted by the first of the year. The completion of this section will shorten the present traveled road between Bieber and Adin, and incidentally from Redding to Alturas, by 4.5 miles, and as it is on excellent alignment, will result in 12 miles of very high speed road, which will materially lessen the time of travel between the above mentioned points.

Four miles of constructed highway from Bieber westward will be treated with the surface treatment of oil during the latter part of July. This will relieve dust conditions for traffic and effectually preserve the surface of the highway and insure its smoothness from now on.

MADERA COUNTY

The Callahan Construction Company of Los Angeles are making first rate progress on their contract for reconstructing the highway south of Madera. Production has reached over 500 tons per day and the paving work should be completed by July 25th.

The Callahan Construction Company are making progress on their reconstruction job between Herndon Bridge and Madera.

Carl H. Peterson is assembling equipment for building the new bridge across the San Joaquin River at Herndon on Route 4.

MARIN COUNTY

Hanrahan Company of San Francisco have commenced work on the reconstruction of a portion of state highway from Gallinas Creek about two miles north of San Rafael to Ignacio, the junction of the Redwood Highway and the Black Point Cutoff. There are numerous line changes to be made in this reconstruction work involving the straightening out of many curves, lowering of heavy grades to 6 per cent maximum and the extension of many drainage structures. At the present time the contractors have two power shovels employed on grading work. Also a large force is employed in extending drainage structures. Some of the utilities are busy moving telephone pole lines and power poles. As soon as grading work has progressed to where it will be permissible to begin paving, a 20-foot second-story concrete slab will be placed over the existing pavement for the entire length of the improvement except on heavy fills where a bituminous macadam pavement will be placed as a temporary expedient pending final settlement.

MARIPOSA COUNTY

The Yosemite All-year Highway is now oiled and in good condition to take care of the traffic to the park which is expected to break all records this season. The prison camp crew near Midpines is widening and straightening the road but the work interferes very little with the traffic.

The convict crew at Midpines, on the Yosemite All-year Highway, are making good progress on the work of widening and straightening the roadway from Mariposa to the King Solomon Mines. The dirt sections of this highway have also been graded and oiled and the road is in good shape for the extremely heavy traffic to the park.

A survey party under the direction of Locating Engineer S. A. Cobb is making a survey between Cathay and Mariposa on Route 18.

MENDOCINO COUNTY

Day labor work is making a great improvement on the alignment of the very narrow and crooked roadway in the vicinity of Lane's Redwood Flat for a distance of approximately 5 miles northerly.

Oil surfacing is being applied on an 8-mile stretch between Piercy and Lane's Redwood Flat, on the Redwood Highway, and in the same vicinity the day

labor work of improving the alignment is in progress. Both these jobs are making a wonderful improvement in the condition of the Redwood Highway at this point.

District IV maintenance forces have been busily engaged during the past month in minor widening and improving of the existing traveled way on the McDonald-to-the-Sea Highway, Route 48, from McDonald's to Booneville. The work has consisted chiefly of cutting off sharp points and daylighting sharp curves, thus increasing the line of vision, installing small wooden drainage structures and blading up the roadway and placing some broken stone or gravel surfacing. While this work is not of a permanent nature it is, however, a marked improvement over the previously traveled road. The principal effect is a marked increase in running time between Booneville and the Redwood Highway.

MERCED COUNTY

Highways in the vicinity of Merced are being improved by filling the old borrow pits.

Sand shoulders and roadsides in the northern part of the county on Route 4 have been oiled and reshaped, providing a much more satisfactory surface free from dust.

Contractor H. C. Whitty has practically completed widening bridges on the Golden State Highway south of Merced.

MODOC COUNTY

It is expected that bids will be opened during August, on the construction of three bridges in the town of Adin, and with favorable weather conditions, these bridges may be completed this year. These bridges take the place of three very old wooden structures, which have long been a source of worry to the local authorities, and with the grading of the highway through the town of Adin and to the Modoc County line on the road to Bieber, will greatly improve travel conditions through Adin.

Work is now under way on the oil mix surfacing of the constructed highway from Alturas 11 miles eastward. Work will be completed in a week or ten days. This will result in a much improved condition for the traffic between Alturas and Cedarville, and also to Lakeview.

Work was started during June on the improvement of the connection from the end of Cedarville Causeway to the Nevada state line. This improvement consists in straightening up the graded road and surfacing it with gravel from pits near the state line. On account of the extremely unstable nature of the light alkali soil over this section, it was found necessary to postpone this work until the early fall rains set in, in order to make possible the construction of a suitable subgrade. The only other alternative was to resort to expensive watering, the cost of which would be prohibitive. Work will be resumed at the earliest practicable opportunity and rushed to completion, so that the road will be in first-class condition for winter traffic.

NAPA COUNTY

District IV maintenance forces have recently completed the oil treatment of the scenic mountain road between Calistoga and the Lake County line on that section of state highway commonly known as the Mt. St. Helena Grade. The oiling of this portion of state highway has been anticipated for the past two years by the various improvement organizations of Lake and Napa counties and considerable comment is now being received from interested parties giving favorable impressions and commenting upon the pleasure it is to these communities to have a dustless road over Mt. St. Helena.

The completion of this surfacing work and the widening work recently completed by our forces in southern Lake County will materially reduce the running time between Calistoga, Middletown and other Lake County points.

PLUMAS COUNTY

The new contract for the grading and crushed rock surfacing of the section of highway from the Tehama County line to a connection with the present road 2 miles southwest of Chester got under way during the past month, and excellent progress is being made by the contractors. It is expected that this 7-mile connection will be completed before the winter sets in, and with the completion of the adjoining section from the Tehama County line westward to Morgan Springs, which is expected to be next summer, will complete the gap between Morgan Springs and the vicinity of Chester, and result in the elimination of the high route followed by the present county road, through a heavy snow belt.

The resurfacing of the Chester Causeway and the mile of highway east of the causeway, extending from Chester to the foot of Chester Grade, has been completed, and will be oiled during July, and also, the main street of Chester will be oiled at the same time. This will relieve a very dusty and disagreeable condition for traffic which has existed for some time.

The convict camp near Paxton, on the Feather River Highway, was completed early in June, and the force has now been built up to 120 convicts who, with two power shovels and other equipment, are making rapid progress in the construction of the upper section of the Feather River Highway. The work is exceedingly heavy on this section, and involves the movement of very large quantities of material and the construction of an unusually large amount of retaining wall. The section now under construction will result, when completed, in a permanent connection to the town of Twain from Quincy and Greenville and other points in Plumas County.

RIVERSIDE COUNTY

A survey has been made and plans completed to construct a portion of the Mecca-Blythe highway (Sun Kissed Trail). The contract will extend from Desert Center to the beginning of the oiled gravel road at Black Butte. The project will consist of grading, constructing a number of timber bridges and a system of storm channels for protection against desert floods, and surfacing with oil treated crushed gravel.

Under this project about 22 miles will be constructed. Approximately 10 miles extending from Black Butte to Blythe has been completed under a former contract.

Graveling and oiling between Mecca and the mouth of Box Canyon has also been authorized. This work will be started at once.

SACRAMENTO COUNTY

Mankel and Staring's contract for placing premixed oil rock shoulders from McConnell to Sacramento has been completed. Their contract for grading the line change at Arno is again going forward after a delay due to water in borrow pit.

SAN BERNARDINO COUNTY

Surveys have been completed and plans are nearly complete for constructing about 35 miles of the National Old Trails Highway between Daggett and Lavic, and about 30 miles of the Arrowhead Trail Highway from Daggett to Beach Line. These two projects will be graded and surfaced with oiled crushed gravel. This is the same type of surfacing now giving excellent service on the highway between Victorville and Daggett.

Approximately 24 miles of the Crest route (San Bernardino to Big Bear Lake), extending from one mile west of the Allison Ranch to Fawnskin and from Big Bear dam to Pine Knot is being treated with fuel oil by the "mix in place" method. This work is nearly complete.

SAN JOAQUIN COUNTY

The concrete paving being placed under contract by Fredrickson & Watson Construction Co. between Mossdale and French Camp is progressing very satisfactorily. A contract for rebuilding the approach to the New Hope Landing Bridge near Walnut Grove has been awarded to Ben C. Gerwick. Work will start soon.

SAN MATEO COUNTY

Granfield, Farrar & Carlin of San Francisco have entirely completed their contract covering grading and placing of a crushed stone surface on that portion of the Bayshore Highway from South San Francisco to Broadway, Burlingame. The grading work consisted principally of restoring to grade sunken areas in the previously graded road across the salt marshes. A crushed stone surface 40 feet wide and 8 inches thick was placed over the entire distance between these cities. The entire contract was completed within the allotted time even though the work extended through the wet winter period, and these contractors, who are new in state highway work, did a very creditable job. The completed roadway surface was treated with a light bituminous surfacing by the maintenance forces of District IV and during the past month, since this road has been completed, it has been subjected to extremely heavy traffic developing in this section of San Mateo County.

The other section of the Bayshore Highway is at present under construction commencing immediately at the south end of the present improved section at Broadway, Burlingame, and extending over entirely new rights of way and J street to Fifth street, San Mateo. A contract for this work was recently awarded to C. W. Wood of Manteca, who at the present time has this grading work well under way. The clearing of right of way for this new line and the actual commencement of grading work has created considerable interest in the cities of Burlingame and San Mateo in that in a relatively short time an entirely new state highway will be available for fast traffic to and from San Francisco. While this section is barely over three miles in length it is a most important connecting link as its completion will permit of a large amount of heavy Peninsula traffic being routed through the streets of San Mateo to the new road and thence to and from San Francisco via South San Francisco.

The most important link in the Bayshore Highway, the section between San Francisco and South San Francisco, is being advertised for bids to be opened August 1, 1928. This is an extremely heavy piece of work involving a total of 805,000 cubic yards of excavation in a length of 3½ miles.

It is expected that contract will be let and a large proportion of the grading and structures completed before the winter rains.

SAN MATEO, SANTA CRUZ AND SANTA CLARA COUNTIES

Following the County Lines along the Crest of Coast Mountains: Twohy Bros. and J. F. Shea Co. of Oakland have the contract for constructing a graded road with crushed rock surfacing on the Skyline Boulevard from the present southerly terminus of the completed road at La Honda Summit over entire new rights of way to a connection with the county and state roads at Saratoga Gap, a distance of 13.8 miles. These contractors have at the present time six power shovels that work in double shift, as follows: One shovel at the La Honda Summit working southerly; two shovels at the Alpine Road working opposite directions; one shovel centrally located between the Alpine Road and Saratoga Summit and two shovels at the Saratoga Summit working north. Inasmuch as this contract involves over 900,000 cubic yards of excavation these contractors will be busily engaged during the present summer and fall season in making an effort to complete all grading work before winter. Additional forces are clearing right of way and installing culverts and setting fences and it is expected this contract will take approximately one year to complete.

SANTA CLARA COUNTY

On the Peninsula Highway near Sargent, the dangerous grade crossing of the Southern Pacific tracks is to be eliminated. Plans for an overhead crossing, consisting of two 64-foot thru plate girder spans and one 30-foot concrete deck steel girder span constructed on a line change to obtain a better crossing, have been prepared by the Bridge Department and bids for contract are to be opened August 1, 1928. As a benefit to the traveling public, this proposed improvement is of inestimable value as this is one of the most dangerous railroad crossings in the state.

SHASTA COUNTY

The convict camp located at the Greenhorn Mine, 20 miles west of Redding, on the Weaverville road, is now making excellent progress in the construction of the highway over the Buckhorn Summit. This construction involves some extraordinarily heavy earth work, the yardage running very close to 100,000 cubic yards per mile for a continuous distance of 5 miles. It is expected that this very heavy section will be completed in a little over a year from the present time.

The contractors started work on the two remaining sections of the Sacramento Canyon reconstruction work during the past two months, and are rushing this 12-mile section to completion before the winter rains set in. This will complete the reconstruction of the Pacific Highway from a point 2 miles north of Redding to Dunsuir, and with favorable weather conditions during the fall, traffic may expect to travel over a very modernized highway next winter and thereafter.

The resurfacing of the Redding-Alturas Highway between Montgomery Creek and Burney, is now under way, and this will result in an 18-foot rock-surfaced road over these 17 miles. It is planned to allow this surfacing to go through the winter, and to oil it early next spring.

SISKIYOU COUNTY

During the month of June the oil surface between the Shasta River near Edgewood and the Oregon line was completely rehabilitated, and also sand and oil shoulders were constructed on the portion of this highway from Hornbrook to the Oregon line. These improvements have placed the Pacific Highway through Siskiyou County in better condition than at any time in the past.

The widening, surfacing and other improvements which have been made all along the lower Klamath River road, from Walker to Orleans and Weitchpec, and also the construction and restoration of numerous bridges on this section, have resulted in a far better road for traffic than at any time in the past, and greatly facilitate the heavy recreational traffic which is going into this beautiful section of country this summer.

Work is just starting on the construction of a maintenance yard at Fort Goff Creek, on the lower Klamath River, about 5 miles west of Seiad. This yard will be a permanent station, and will greatly facilitate the handling of the maintenance organization on this section.

SOLANO COUNTY

Larsen Brothers are making good progress on grading the line change back of Cordelia. This contract includes a concrete bridge over Green Valley Creek and crushed rock premixed oil surface.

SONOMA COUNTY

Larsen Bros. of Los Banos have completed the grading and surfacing with crushed rock of the approaches to the Sonoma Creek Bridge near Schellville. This improvement is on a line change obviating two very sharp curves and the completed work presents an improvement pleasing to the travelling public as it includes the construction of a new pony steel truss span across Sonoma Creek and the grading of the approaches to present day standards of a 30-foot road-bed with a crushed rock surface 20 feet wide. As soon as the work of Larsen Bros. had been completed to a state where the rock surface was ready for oil treatment a thin oil treated surface was placed as a dust palliative by the maintenance forces of District IV.

STANISLAUS COUNTY

Bids have been received for rebuilding the south approach to the Stanislaus River Bridge near Ripon. The low bidder was Mr. C. W. Wood. The contract has been awarded but not approved. This job consists of a fill to replace part of the old trestle and three timber bents. The fill will be surfaced with premixed oiled rock.

TEHAMA COUNTY

The convict camp engaged on the construction of 17 miles of state highway on the Inskip Grade section, about 20 miles east of Red Bluff, is now well organized and at work. The progress reported is very satisfactory. This work will result in the elimination of the worst grade on the Red Bluff-Susanville Highway, and it is expected the convict construction will be completed early next spring.

During the past month 12 miles of road east of Red Bluff has been oiled over the crushed rock surface which was provided during the winter season. This results in a smooth and dustless road for traffic, over what was the roughest and most disagreeable portion of the Red Bluff-Susanville Highway during previous summers. Also, dust laying oil was applied over the following 8 miles to Paynes Creek, and the constructed highway from Paynes Creek for 8 miles eastward was reoiled, as were several short sections of the highway west of Mineral. The combined result of this oil gives a very serviceable and dustless road into Lassen National Park, and this summer season's traffic over this recreational road will be better served than in previous years.

TRINITY COUNTY

The convict camp which started work in May, on the section of highway between the Buckhorn Summit and Grass Valley Creek, on the Redding-Weaverville road, is making excellent progress, and this section of the highway will be completed this summer, thereby eliminating several narrow and dangerous sections of the old road.

With the completion of the bridge across the Trinity River at Cedar Flat, this spring, and the general cleaning up and the minor improvement here and there of the lower Trinity road, travel conditions between Weaverville and Eureka this summer have been better than at any time in the past.

TULARE COUNTY

The unpaved portion of the Sierra-to-the-Sea Highway from Three Rivers to the Sequoia National Park boundary has been oiled and is in good shape for the summer travel.

The unpaved portion of the Sierra-to-the-Sea lateral connecting with the General's Highway in Sequoia National Park, has been oiled and is serving the heavy traffic to the park in good shape.

TUOLUMNE COUNTY

On the Sonora-Mono Highway, oil has been placed from Sonora to Strawberry with the exception of the government road. Between Pooleys and Long Barn, the Big Oak Flat road has been oiled from Mountain Pass to the South Fork of the Tuolumne River, and from Mather Turnout to the Park Line on the Tioga road, leaving only 17 miles on the entire Big Oak Flat road which have not been oiled. These 17 miles are being maintained with sprinkler trucks so the road is free from dust.

YOLO COUNTY

The last 19 bents on the west end of the Yolo Causeway were lowered by state forces to give greater visibility for the purpose of eliminating accidents. The bents were lowered to a maximum cut of two feet which made a great improvement in the structure. Bids were recently asked for but being too high, it was decided to do the work by state forces and all work was completed for less than the original engineer's estimate.

Rock shoulders have just been completed between the M street subway and $1\frac{1}{2}$ miles east of the Yolo Causeway.

The contract for filling the borrow pits and placing premixed rock borders for $1\frac{1}{2}$ miles east from the Causeway in West Sacramento is progressing rapidly. The work is being done by D. McDonald, contractor.

Last Tollgate Quits the Road

The last tollgate in England was removed this week and the woman keeper who had guarded it for sixty years has retired with the distinction of being the last of her calling.

Thus ends a system of highway building and maintenance that reached its peak in the era of the stage coach. In 1820 Great Britain had 114,829 miles of turnpike roads and highways, for the most part well surfaced with easy grades and many fine bridges. Indeed, so great was the power ascribed to the highway system that it is the claim of some writers that the Union of England and Scotland was more due to the building of the famous "Old North Road" from London to Edinburgh in 1707 than to dynastic reason. Certainly the extension of the road to the north of Scotland, a total distance of 340 miles, played a part in stimulating the industries of both nations.

It may be asked, now that the turnpikes are abolished, what will become of the misanthropes who were supposed to take naturally to the keeping of toll gates? Samuel Weller, Sr., made the dreadful threat that he would retire and "keep a pike" as evidence of his hatred of men. The sour temper of the pike-keeper is proverbial. Only the power of female beauty could soften it. Of the entrancing Irish widow it was written that she so dazzled the pike-keeper that he

Never asked for the toll
But scratched his bald poll
And looked after the lowbacked car.

Those days are gone forever. Yet we continue to pay toll and to build and maintain highways without the pike-keeper. Our toll is paid in gas tax and license tax and there is not a tollgate to impede our progress.—*St. Paul Pioneer Press.*

Highway Officials

Warned To Beware

Of Impostor's Activity

The following self-explanatory letter has been sent to all heads of departments and district engineers by C. H. Purcell, State Highway Engineer:

"June 25, 1928.

"Our attention has been called to the fact that a man has been approaching employees of the Division of Highways with the statement that he has important political connection with the administration, even claiming to have connection with the highest officials of the state. He also claims that he has close connection with rock and material companies and that he has power and influence enough to coerce engineers or secure their removal. It has been reported that he has approached rock contractors with the same story and that he can make it easy for them if they will enter into an arrangement to pay him a royalty.

"If this man should present himself to your district, please report all the circumstances to this office immediately by wire.

"At least two employees of this Department have reported the activities of this man. Their action in this respect is very commendable and I am sure that any of our employees would act in the same way under the circumstances.

"Needless to say this man is misrepresenting facts and all cases will be investigated immediately and effort made to put a stop to his activities. We hope you will emphatically inform this man that his kind can not reach any member of this division and that you will take action to see that the matter is reported immediately.

"We believe it desirable that each of your engineers be informed of the facts contained in this letter. Also any rock companies in your vicinity which may possibly have been approached by this man should be given this information."

Record of Bids and Awards

GLENN COUNTY—Between Butte City and the easterly boundary 6.3 miles of gravel surfacing. Dist. 111, Rt. 45, Sec. C. Engr's Est. \$18,400. Bids opened July 25th as follows: Kern & Kibbe, Portland, \$24,725; William C. Ellsmore, Eureka, \$16,905; Force, Cur-rigan and McLeod, Oakland, \$13,225; L. C. and W. E. Karstedt, San Jose, \$17,135; C. W. Wood, Stockton, \$24,150; J. F. Collins, Stockton, \$19,550; E. B. Bishop, Sacramento, \$18,630; Tieslau Bros., Berkeley, \$16,675; Mankel & Staring, Sacramento, \$16,675; A. Teichert & Son, Sacramento, \$15,870; A. F. Giddings, Sacramento, \$24,725. Contract awarded to Hemstreet & Bell, Marysville, for \$13,225.

HUMBOLDT COUNTY—Between Fortuna and Fernbridge, 2.1 miles grading and crushed gravel or stone surfacing. Dist. 1, Rt. 1, Sec. G. Engr's Est. \$51,795.35. Bids opened July 18th as follows: Mercer-Praser Co., Eureka, \$57,341.15; Engelhart Paving Const. Co., Eureka, \$47,775.45; Tieslau Bros., Berkeley, \$48,136.95; W. H. Hauser, Orick, \$46,803.10; Ariss-Knapp Co., Oakland, \$54,509.60. Contract awarded to W. H. Hauser.

HUMBOLDT COUNTY—0.2 mile grading and surfacing approach to North Scotia bridge near Scotia—Redwood Highway. Dist. 1, Rt. 1, Sec. E. Engr's Est. \$9,786.30. Bids opened July 5th as follows: Markle and Hurey, Berkeley, \$9,557; Smith Bros., Eureka, \$9,378.10; Engelhart Paving & Const. Co., Eureka, \$10,714. Contract awarded to Smith Bros. of Eureka for \$9,378.

IMPERIAL COUNTY—Near Araz Junction, an undergrade crossing of the Inter-California R. R.; also a bridge and $\frac{3}{4}$ mile grading and surfacing with oil treated surfacing. Dist. VIII, Rt. 27, Sec. B. Engr's Est. \$35,133.66. Bids opened July 11th as follows: L. Worel, Alhambra, \$29,805; McWilliams, Ritchey, Los Angeles, \$40,482.50; Pioneer Transfer Co., Calexico, \$34,933.50; M. Blumenkranz, L. A., \$40,046; W. M. Ledbetter, L. A., \$32,815.45. Contract awarded to L. Worel for \$29,805.

LAKE COUNTY—Across Cache Creek, reinforced concrete girder bridge. Dist. III, Rt. 15, Sec. C. Engr's Est. \$59,780. Bids opened June 13th as follows: Geo. Ulrich Const. Co., Modesto, \$64,600; McDonald & Maggiora, Sausalito, \$56,820; Chas. and E. W. Steffgen, San Diego, \$76,771.50; Otto Parlier, Tulare, \$53,715; M. B. McGowan, San Francisco, \$62,750. Contract awarded to Otto Parlier.

LASSEN and MODOC COUNTIES—Between Bieber and Adin, 12.5 miles grading and surfacing with screened gravel. Engr's Est. \$136,291. Bids opened July 18th as follows: Harlan White, San Francisco, \$138,839; J. P. Brennan, Redding, \$153,379.40; Isbell Const. Co., Carson City, Nev., \$134,066; Tieslau Bros., Berkeley, \$127,376; Hemstreet & Bell, Marysville, \$141,377; Kern & Kibbe, Portland, \$111,997; Coolidge & Scott, Reno, \$107,156.50; Ariss-Knapp Co., Oakland, \$136,422.50; C. T. Malcom, Walnut Creek, \$134,534; Earl L. McNutt, Eugene, Ore., \$128,994.40. Contract awarded to Coolidge & Scott.

MONO COUNTY—2.1 miles of grading from Dogtown to Point Ranch. Dist. IX, Rt. 23, Sec. I. Engr's Est. \$18,243.20. Contract awarded to Coolidge & Scott, Minden, Nevada, \$16,478.70.

ORANGE COUNTY—Grading and paving with Portland cement concrete 0.8 mile between Anaheim and Fullerton. Dist. VII, Rt. 2, Sec. E. Engr's Est. \$38,752. Bids opened July 10th as follows: Bartlett & Mathews, Pasadena, \$33,803.45; Griffith Co., Los Angeles, \$33,850; Matich Bros., Elsinore, \$36,217; H. E. Cox & Son, Pasadena, \$38,259.80; Wells & Bressler, Santa Ana, \$41,271. Contract awarded to Bartlett & Mathews.

PLACER COUNTY—A reinforced concrete girder bridge across the Truckee River at Tahoe City. Dist. III, Rt. 38, Sec. A. Engr's Est. \$22,672.50. Bids opened June 20th as follows: McDonald and Maggiora, Sausalito, \$28,450; Paul M. White, Santa Monica, \$23,988. Contract awarded to Paul M. White.

PLACER COUNTY—Quarrying and depositing crushed stone in windrows between Baxter's and 1 mile east of Shelter House. Dist. III, Rt. 37, Sec. D-E. Engr's Est. \$14,560. Bids opened July 20th as follows: Tieslau Bros., Berkeley, \$14,560; Hemstreet & Bell, Marysville, \$14,280. Contract awarded to Hemstreet and Bell.

PLACER COUNTY—Three reinforced concrete girder bridges across the South Fork of the Yuba River. Dist. III, Rt. 37, Sec. F. Engr's Est. \$38,102.50. Bids opened July 5th as follows: M. A. Jenkins, Sacramento, \$41,822.50; H. C. Whitty, Sanger, \$45,200; Paul M. White, Santa Monica, \$48,772.50; Obert Bros., Los Angeles, \$60,463; Coolidge & Scott, Minden, Nev., \$34,290.50. Contract awarded to Coolidge & Scott.

PLACER COUNTY—Two overhead crossings over the S. P. R. R. at Bowman. Dist. III, Rt. 37, Sec. A. Engr's Est. \$36,408.75; Bids opened July 11th as follows: Geo. J. Ulrich Const. Co., Modesto, \$41,720; Peter F. Bender, North Sacramento, \$35,805; Butte Construction Co., San Francisco, \$32,251; M. A. Jenkins, Sacramento, \$40,680; H. C. Whitty, Sanger, \$36,600; Fredrickson Bros., Stockton, \$43,220. Contract awarded to Butte Construction Company.

PLACER and NEVADA COUNTIES—Between Indian Springs and Soda Springs, 10.6 miles of grading. Dist. III, Rt. 37, Sec. A-P-B. Engr's Est. \$313,046.25. Bids opened July 18th as follows: Robinson-Roberts Co., Los Angeles, \$416,879; Jasper-Stacy Co., San Francisco, \$394,883; C. R. Adams, Mt. Shasta City, \$379,747; The Callahan Const. Co., Los Angeles, \$242,441.50; Ward Engineering Co., San Francisco, \$299,980.75. Contract awarded to Callahan Construction Co.

PLACER COUNTY—A reinforced concrete girder overhead crossing over the S. P. R. R. at Weimar—on the Victory Highway. Dist. III, Rt. 37, Sec. B. Engr's Est. \$29,777.50. Bids opened June 20th as follows: M. A. Jenkins, Sacramento, \$25,557.50; Butte Construction Co., San Francisco, \$25,546.05; Oberg Bros., Los Angeles, \$30,380; George J. Ulrich, Modesto, \$34,878.75; P. F. Bender, North Sacramento, \$29,382.50; Dann & Maney, Portland, Ore., \$32,382.50; A. W. Kitchen, San Francisco, \$23,147.10; Coolidge & Scott, Minden, Nev., \$27,324; Paul M. White, Santa Monica, \$32,081. Contract awarded to Butte Construction Co., \$25,546.05.

SAN DIEGO COUNTY—7.2 miles to be graded between Viejas Creek and Guatay Creek. Dist. VII, Rt. 12, Sec. D. Engr's Est. \$248,588. Bids opened July 5th as follows: Nelson, Sloan, Otay, \$344,893; Hauser Construction Co., Long Beach, \$237,626; George J. Bock, Los Angeles, \$391,501; C. G. Willis and Sons, Los Angeles, \$253,649; H. G. Penton, San Diego, \$278,229; Geo. Mitchell, Huntington Park, \$290,304; Watson & Sutton, San Diego, \$357,145; Herbert Nunn and J. T. Logan, Encinitas, Wash., \$291,118; Ross Construction Co., Los Angeles, \$241,113; Nevada Construction Co., Fallon, Nev., \$292,712; Isbell Construction Co., Fresno, \$322,024; C. R. Adams, Oakland, \$274,364; Jahn & Bressi, Los Angeles, \$259,816. Contract awarded to Hauser Construction Co., Long Beach, \$237,626.

SAN JOAQUIN COUNTY—Between Cherokee Sta. and Live Oak, 5.1 miles widening of roadbed. Dist. X, Rt. 4, Sec. C. Engr's Est. \$46,484.50. Bids opened July 18th as follows: A. F. Giddings, Sacramento, \$34,738.90; Tieslau Bros., Berkeley, \$37,534; Geo. French, Jr., Stockton, \$38,125; Fredrickson & Watson, Oakland, \$31,912.90; M. J. Bevanda, Stockton, \$32,866; C. W. Wood, Stockton, \$47,771.30; Willard & Biasotti, Stockton, \$44,459.50; Mankel & Staring, Sacramento, \$36,579; D. McDonald, Sacramento, \$31,279.40; Camino Construction Co., Palo Alto, \$41,664.50. Contract awarded to D. McDonald.

SHASTA COUNTY—Between Shotgun Creek and Conant, 5.8 miles grading and surfacing crushed gravel or stone. Dist. II, Rt. 3, Sec. D. Engr's Est. \$259,909.60. Bids opened June 6th as follows: Kern and Kibbe, Portland, Ore., \$275,065.95; J. T. Loban, Medford, Ore., \$305,448.20; Mathews Construction Co., Sacramento, \$266,107.20; Ward Engineering Co., San Francisco, \$296,531.65. Contract awarded to Mathews Construction Company.

SISKIYOU COUNTY—The Fort Goff Creek Maintenance Yard. Dist. II, Rt. 46, Sec. B. Engr's Est. \$5,062. Contract awarded to J. M. Lemon, Etna, for \$5,430.

SOLANO COUNTY—Between Cordelia and Rockville, 3.1 miles of grading and crushed gravel or stone surfacing, oil treated. Dist. X, Rt. 8-7, Secs. A-B, Engr's Est. \$78,113.70. Bids opened June 13th as follows: Larsen Bros., Sonoma, \$62,704.50; J. V. Galbraith, Petaluma, \$80,210.70; J. P. Holland, Inc., San Francisco, \$85,914.50; Kaiser Paving, Oakland, \$79,908.40; Force, Curriegan & McLeod, Oakland, \$83,091; J. E. Johnston, Stockton, \$87,312.25; Pacific States Construction, San Francisco, \$88,517.50; W. J. Taylor, Palo Alto, \$78,280.75; Tieslau Bros., Berkeley, \$72,698.50; A. Teichert & Son, Sacramento, \$73,839.75. Contract awarded to Larsen Bros. of Sonoma.

STANISLAUS COUNTY—Grading and surfacing 0.04 of a mile and constructing timber trestle approaches at south end of Stanislaus River bridge. Dist. X, Rt. 4, Sec. B. Engr's Est. \$10,785.50. Bids opened June 18th as follows: C. W. Wood, Stockton, \$8,254.25; Lee J. Immel, Berkeley, \$8,855; Pacific Construction Co., \$14,093.80; M. A. Jenkins, Sacramento, \$8,517.30. Contract awarded to C. W. Wood.

TULARE COUNTY—Widening existing bridges across Cameron Creek and Packwood Creek and building a new reinforced concrete bridge across Mill Creek. Dist. VI, Rt. 4, Sec. F. Engr's Est. \$10,301.20. Bids opened June 20th as follows: Noble Bros., Visalia, \$11,374; W. H. Cartright, Hanford, \$10,753.75; Oberg Bros., Los Angeles, \$11,253.25; Paul M. White, Santa Monica, \$12,592; H. C. Whitty, Sanger, \$11,440; Guy G. Noble, Tulare, \$9,177.37; R. Hodgson & Son, Porterville, \$11,483.20; C. R. Gurdy, Porterville, \$10,645.30; Earl Bowen, Strathmore, \$9,380.47. Contract awarded to Guy G. Noble.

VENTURA COUNTY—11.6 miles to be graded and paved with Portland cement concrete between Hueneme Road and Little Sycamore Creek. Dist. VII, Rt. 60, Sec. A. Engr's Est. \$579,863. Bids opened July 5th as follows: United Concrete Pipe and Const. Co., Los Angeles, \$560,417.50; Thomas M. Morgan, Los Angeles, \$534,662.50; Dillon and Boles, L. A., \$550,442.50; Hanrahan Company, San Francisco, \$539,385; Jahn & Bressi Const. Co., L. A., \$468,324.50; Fredrickson & Watson Const. Co., Oakland, \$518,408.16; George Herz & Co., San Bernardino, \$519,381; Sam Hunter, Santa Barbara, \$536,957.50; Ed. Johnson & Sons, L. A., \$615,772; J. F. Knapp, Stockton, \$490,515. Contract awarded to Jahn & Bressi for \$468,324.50.

YOLO COUNTY—Guard rail and wheel guard on Yolo causeway, timber portion. Dist. X, Rt. 6, Sec. A-B. Engr's Est. \$9,880. Bids opened July 9th as follows: Holdener Const. Co., Sacramento, \$10,966.80; Peter F. Bender, North Sacramento, \$9,781.20; M. A. Jenkins, Sacramento, \$10,744.50; B. C. Burnett, Turlock, \$10,793.90. Contract awarded to Peter F. Bender.



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Feather Falls near Oroville,
Butte County.

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California's Next Big Job Is Parking Our State Highways

By FRED S. MOODY, Member, California Highway Commission.

CALIFORNIA'S foremost appeal to visitors, as well as her own citizens, lies in the state's variety of scenic beauty and in the abundant opportunities found here for the enjoyment of outdoor life. Her reputation as an outdoor state is based on her foam-fringed stretches of ocean beach, her towering forests of redwood and other majestic trees, her wooded lakeshores, and her thousand-and-one features of charm and interest. Nowhere in the world can such variety of landscape be enjoyed within such a comparatively brief radius as in California.

This is why the name "California" has come to mean an alluring outdoor playground for millions in America. It is why many observers have declared that no industry, not even agriculture, has the permanent possibilities for the future in California as has the tourist industry.

And it is largely because of our highway system that this is so. A splendid network of highways traversing every section of the state and costing millions of dollars has made California a motorist's paradise. While the excellence of construction in these roads, the ease of travel they afford, is a source of gratification, nevertheless, at least half the value of such a highway system lies in the fact that it makes accessible the diversified charm of the state. To attain their highest use the roads must lead through scenes to charm the eye and to spots of recreational interest and surpassing beauty. The value of any system of highways is two-fold: the first, or economic, facilitating the movement of commercial traffic from one point to another, and the second, the recreational use. Some of our highways are largely recreational. Perhaps 50% would not be too high a proportion

to allot to the recreational functions of the entire system. These highways, in order to fulfill their highest destiny, must therefore lead to and through the innumerable points of attraction which make this state foremost as an unexcelled all-year playground.

Before the advent of good roads, many of the attractions that the state has, while of surpassing interest and value, were little known or enjoyed beyond their own localities. But all this now is changed. The motorist, whether he be tourist or permanent resident, is not content until he has explored forests, deserts, mountain passes that only a few years ago were considered inaccessible. And hand in hand with this greater mobility of the vacationist and traveller has come increasing evidence that easily traveled highways, while they make the beauty spots of the state available, at the same time facilitate their destruction and their loss to the general public.

Thus it is that the cry has gone up that unless something is done soon, many of our greatest attractions will disappear; that California's finest ocean beaches are being fenced off and lost to the public; that our redwoods, oldest of living things, are being cut; that many other scenic areas and historic landmarks will soon be gone unless the state acts now to save them. Where commercial exploitation, facilitated by good roads, does not aid this process, private appropriation to the exclusion of the public is hastening the day when California can no longer be considered the playground of America.

If, we are told, California fails to save her finest scenic, recreational, historic and scientific areas, she will have lost her greatest asset. These attractions are the basis of our



A scene on the Navarro River, Mendocino County.

tourist business which now brings California over \$150,000,000 in revenue each year. California's rapid growth in population—close to a quarter of a million people annually—is said to be exhausting the present opportunities for outdoor life. What is the value, we are asked, of spending millions on a highway system which is 50% recreational if the roads lead us through fields of blackened stumps which were once mighty forests, and along a shoreline fenced off from the public with signs everywhere: "Private Property—Keep Out!"

To remedy this situation, California at the last legislature adopted a real park policy. A central State Park Commission was created under the Department of Natural Resources.



The Narrows, Painted Canyon, near Mecca, Riverside County.

Five prominent citizens from different parts of the state were called to serve without salary on this commission. And a state park survey was authorized.

Thus the state is doing now something that should have been done long ago. The first real inventory of California's scenic and recreational resources is now being made in the survey being directed by Frederick Law Olmsted, nationally known park expert and landscape architect, under the auspices of the State Park Commission. This survey is for the purpose of taking stock of California's attractions with a view to determining the



Windblown cypress and surf at Point Lobos, Monterey County.

finest in each section of the state which should ultimately be reserved as parks or monuments. To date, approximately 300 proposed parks and monuments have been suggested, including the very best things which California has to offer to the world. The survey, when completed, will list these areas in the order of their importance and uniqueness and the urgency of their preservation. Preservation societies and local committees have suggested beach and ocean shore parks, forest parks containing unique and rare species of trees, desert parks with strange and beautiful formations and rare flora, mountains, lakes, waterfalls, historic landmarks, objects of scientific interest, petrified forests, geysers and Indian pictographs.

This survey shows the great and varied opportunities for preservation in California. It shows that every part of California contains objects of beauty and interest which will be lost to the public unless action is taken very soon to set them aside under the custody of the state. It is fortunate that a capable State Park Commission has been appointed to administer all parks and that the survey is going on under expert direction of one of America's foremost park authorities, for this work has started none too soon.

And, as a necessary step in the process of preserving the finest of these areas, most of which are either directly on our highways, or



The old bastion, Fort Ross, Sonoma County.

easily accessible therefrom, the 1927 legislature unanimously passed the State Park Bonds Act which goes before the voters for ratification on November 6th.

This measure, known as Amendment No. 4, provides for the ultimate issuance of \$6,000,000 in state park bonds but with the important provision that each dollar of state money spent for parks must be matched with another dollar from private gift or local sources. Governor C. C. Young, a staunch advocate of the state park program, has pointed out, not only the urgency of this bond issue, but also the respects in which it



A view at Palisades, Santa Monica, which illustrates why California must save its beaches.

differs from other bond issues. Speaking recently before the National Conference on State Parks in San Francisco, he said:

"Aside from such bond issues as those for veterans' welfare, where only the credit of the state is loaned and the money received from the veterans ultimately retires the bonds, bond issues in the past have been mainly for state buildings or for state roads. When bond interest is taken into account, I believe that this is an expensive method of construction. Our state building program can be most economically carried out through regular biennial appropriations. Our state highways can most satisfactorily be built through some 'pay as you go' system such as the gas tax.

"The proposed park bond issues, however, presents an entirely different situation. Our



Rubicon Point at Lake Tahoe.

California beaches, which once could have been bought cheaply and dedicated to the enjoyment of the public, are now with few exceptions held at so high a price as to be out of reach. Just so will it be with our forests, the remaining beaches, and other beauty spots suitable for state parks, unless these are purchased in the very near future.

"Accordingly, economy requires that our state park system be secured, now, before the private demand for such locations has too greatly increased their price. And, since the cost of any adequate park system would be clearly too great to be met by a legislative appropriation, the only means of making such purchase now, while prices are still within reason, must be by a bond issue.

"Moreover, when state buildings or state roads are constructed through a bond issue, the buildings begin to become obsolete, or the roads begin to wear out, before the public



In the Calaveras Big Trees. The first grove of *Sequoia Gigantea* was discovered in 1852. At one time it was one of the traveled routes into California.



Palm Canyon, San Jacinto Mountains.

finishes paying out money to redeem the bonds. In the case of parks, however, if the purchases are made wisely, by the time the last of the bonds mature, the state has an investment worth many times its original cost.

"Finally, this proposed bond issue is different from any other I have ever known, in that one dollar is made to do the work of two. There are many wealthy friends of the park movement, both in this and in other states, who would like to help preserve as parks some of California's natural beauties, provided the state will also show its interest by joining with them in making such preservation possible.

"This park bond issue has accordingly been so devised that not a dollar of state money shall be expended until it is matched by another dollar of private beneficence or from local sources. In other words, the first \$100,000 of bonds will be sold only when there is another \$100,000 of private or subscribed money waiting in the treasury, thus permitting the purchase of \$200,000 worth of park lands.

"In this way, the \$6,000,000 park bond issue will secure for our state a \$12,000,000 park system, covering every portion of the state. With this set-up, and with the high character of the Park Board which will oversee the expenditure of this money, it is little wonder that the plan is being universally endorsed as a wonderful opportunity to create for California a permanent unified park system second to none in the Union."

Tandem maintenance is believed by the New Mexico highway officials to have proved its superiority over ordinary methods in maintaining gravel and earth roads. It has been adopted exclusively in the Torrance County Training School District and it will probably be adopted throughout the state because of the good road surfaces obtained, its economy in manpower, and the elimination of the ridges of loose material on the roadway.

Bayshore Highway, Huge Road Project, Is Now Under Way

THE CONTRACT for the grading and surfacing of the Bayshore highway for 3.5 miles between San Francisco and South San Francisco was awarded to H. W. Rohl Co. of Los Angeles. This work is mostly over new line and grades, utilizing the old road for short distances near each end, and gives excellent alignment and grades over two prominent points of land, Visitacion and Sierra points. There were 19 bidders on this contract and the low bid of \$661,000 was within \$1,000 of the engineer's estimate for the work.

Entailing, as this contract does, the excavation of 805,000 cubic yards of material, much of which is rock, the construction of a concrete railroad underpass, a 20-foot arch 120 feet long, and a massive rubble masonry retaining wall 315 feet long with a maximum height of 28½ feet; also the placing of rock pavement, consisting of a 40-foot by 4-inch base with a 4-inch oil-treated surface course, this is indeed a gigantic project.

The contractor has made a start on the work, having installed two shovels with 14 trucks and several tractors with graders and bulldozer. In the time that he has worked, he has already made a sizable cut in the Visitacion Point hill. The fill looms up giving a fair idea of the ultimate improvement when the heavy cut at Sierra Point is made and the entire fill across the Guadalupe Canal completed.

As the material to be excavated can be handled in wet weather, the grading will carry through the rainy months and spring should see this job in good shape for completion early in the year.

C. W. Wood, contractor on the section of the Bayshore Highway between Broadway Station and San Mateo, has completed the major portion of his contract. The clearing, grading, pipes and concrete structures are complete; much of the rock base and top have been laid and oiling is to be started about the middle of September.

A couple of months more will see the opening of this section, giving a clear road from South San Francisco to San Mateo. This will be fully appreciated by the traveling public as is evidenced by the traffic count taken in July, which shows an average of 8000 vehicles per day using the section to the north recently completed by Granfield, Farrar and Carlin.

Effect of Road Distance on Automobile Operating Costs

CAR OPERATING COSTS AFFECTED BY DISTANCE SELDOM EXCEED THREE CENTS A MILE

By N. D. DOUGLAS, Assistant Engineer, Division of Highways, Sacramento, California.

THE HIGHWAY engineer often finds it necessary to consider the value of distance when comparing alternative road locations. A certain initial additional expense to reduce distance is usually justified. Roughly speaking this is the capitalized value of the saving effected by the distance reduction. This saving consists of two parts: (1) the possible saving of roadway expense, and (2) the saving in the cost of operation of traffic.

Cost Estimates—It is believed that most engineers make only rough estimates, based on arbitrary assumptions, of the effect of distance on operating costs and that they are inclined to overestimate its unit value. In engineering reports the usual claim is that highway distance reduction will save from six cents to 12 cents per car-mile, and this saving is balanced against other cost items to determine the feasibility of a project.

In Bulletin 69, "Highway Transportation Costs," Engineering Experiment Station, Iowa State College, it is shown plainly that vehicle operating costs should be divided into mileage costs and time costs; the former are due directly to mileage, and the latter are independent of mileage and due to time of service only. Based on a large number of experiments, observations and collected data, the same bulletin suggests that the average costs of operating trucks and passenger automobiles are as given in the accompanying table.

Obviously license, garage, insurance and interest charges are time costs independent of mileage. Our investigation, then, should consider only the items of gasoline, lubrication, tires, maintenance and depreciation. Passenger cars will be considered first.

Gasoline—It is assumed that the figures in the table represent the over-all cost of average operation, including stopping and starting, idling, warming up, operating in city traffic and over various types of roads, choking, etc. It is estimated that fully 10 per cent of the

gasoline used by the average car is wasted by these operations. Highway distance will not affect this waste, but will affect gas consumption only on the open road.

For example, a Ford touring car in good condition will deliver 18 to 20 miles per gallon of gas in city operation and about 27 miles per gallon on long runs at about 30 miles per hour through average country. If 20 per cent of the car mileage were in city traffic, the gas consumption would be 10 per cent greater than it would be if the total mileage were on the open road.

A modern car of the \$1,000 to \$1,800 class will make 14 to 16 miles per gallon of gas under ordinary conditions on a concrete road of moderate grades. At 22 cents per gallon, the gasoline cost would be about 1.38 cents to 1.46 cents per mile.

The lighter cars average 20 to 30 miles per gallon of gas, which costs 0.73 cent to 1.10 cents per mile. A survey by National Automobile Chamber of Commerce covering 17,000,000 cars owned in the United States in 1926 indicates that about 64 per cent of them were cars whose list price was \$800 or under. The proportion of heavy cars above the \$1,800 class is very small. An average open road gasoline cost for all cars based on a conservative average of the foregoing figures would be about 1.28 cents per car-mile.

Lubrication—Oil consumption also should be considered only for open road operation. The average modern car in fair condition uses 4 to 6 qts. of oil in the crankcase, plus an additional quart about every 200 miles, or, say, 8 qts. per 800 miles if changed every 800 miles. California prices range from \$0.30 to \$1.40 per gallon for various oils. A conservative average for the individual consumer would be about \$1.10 per gallon, or 0.28 cent per car-mile.

Most new cars will use only the amount required to refill the crankcase every 800 or 1000 miles, or barely three-fourths of the amount allowed above. For future estimates, 0.21 cent per car-mile is considered a suf-

The above article appeared in the August number of *Engineering News-Record*.

ficient allowance for lubrication under ordinary conditions. The item of greasing is too small to be considered.

Tires—The usual assumption that tire costs vary directly with mileage is an error. Wear resulting from rim cutting, under-pressure, punctures, wheels out of alignment, running off pavement shoulders, bruises, skidding, exposure, etc., can not be laid to highway distance.

In Engineering Bulletins 16 and 17, "The Relation of Road Surface to Automobile Tire Wear," published by the State College of Washington, experiments are described that indicate that tires will last about 40,000 miles on pavement. Mileages of 20,000 or more are not unusual. The writer has averaged better than 15,000 miles on a combination of all kinds of roads, some very rough, and driving a car only about 7000 miles a year.

A set of four good high-pressure tires and tubes for a Ford car costs about \$48. A set of the best balloons for a Buick Master Six costs about \$160. A high average between these extremes would be \$100, which, with a life of 20,000 miles, would indicate a tire cost of 0.50 cent per car-mile. This mileage is obtained, or exceeded, by taxicab companies, buses, etc., operating on pavement.

Maintenance—The maintenance cost is the most variable item. It includes repairs due to rusting, accidents, faulty lubrication, excessive speed, painting, brake band renewals, etc., and therefore does not vary directly with highway mileage and is increased considerably by operation in city traffic. In the absence of more adequate data, the item of 1.24 cents per car-mile shown in the table can be assumed correct although it probably is high.

Depreciation—The item of depreciation is mainly a time item. The resale value of a car is determined usually by its model and age. Obsolescence is a very important factor. A four-year-old car driven 20,000 miles is worth no more on the market than a four-year-old car of the same type driven 50,000 miles.

Considering the small ratio that the usual distance saving would bear to the total car mileage, it would seem that the item of depreciation should not be considered ordinarily in figuring the value of distance.

Time—Another item often used in arguments for road improvements is "time" saved or lost by distance. The general belief that time is always worth money is a popular fallacy, because the average passenger car driver is not producing in the economic sense, and

AVERAGE COSTS OF OPERATING MOTOR VEHICLES
TRUCKS

Item		Cents per ton-mile	
Driver-----	Time	2.29	3.81
License-----		0.10	
Garage-----		0.29	
Interest-----		0.30	
Insurance-----		0.31	
Supervision-----		0.52	
		<hr/>	
Gasoline-----	Mileage	1.00	3.93
Oil-----		0.12	
Tires-----		0.71	
Maintenance-----		0.99	
Depreciation-----		1.10	
		<hr/>	
Total -----		7.74	

AVERAGE COSTS OF OPERATING MOTOR VEHICLES
PASSENGER CARS

Item		Cents per vehicle-mile	
Interest-----	} Time	1.24	} 2.97
Insurance-----		0.31	
Garage-----		0.83	
License-----		0.59	
		<hr/>	
Gasoline-----	} Mileage	1.61	} 7.30
Oil-----		0.31	
Tires-----		0.98	
Maintenance-----		1.24	
Depreciation-----		3.16	
Total-----		<hr/>	10.27

would not produce more or less if he reached his destination a few minutes earlier or later. Usually, at best, it would be a matter of only slight convenience. Suburban and commuting traffic is an exception to this general premise.

In the case of alternative routes involving long distances of several miles, or more, the value of time saving should be considered as far as concerns business traffic, but care should be used to hold the consideration within the limits of fact, avoiding extra expense for some imaginary benefit.

From the preceding count the distance cost items of the average passenger car can be tabulated as follows:

Item	Cents per mile
Gasoline -----	1.28
Lubrication -----	0.21
Tires -----	0.50
Maintenance -----	1.24
Total -----	<hr/> 3.23

These figures are based on fairly high prices and ordinary operation, and are more conservative than the claims of manufacturers. The writer's experience has been that his own costs have run lower. Increasing automobile efficiencies will tend to reduce the items, or at least to offset any price rises.

Considering the average trunk highway, it is believed that, in general, expenditures for highway distance reduction may be premature or may represent economic waste if based on

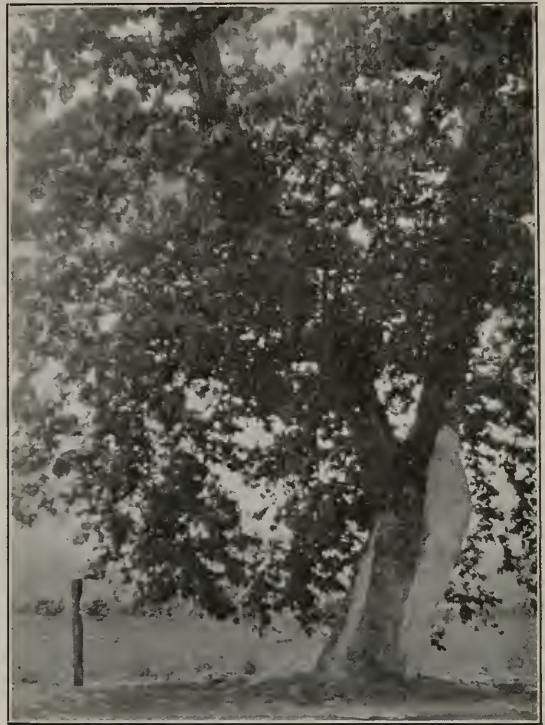
Preserving the Roadside Trees

TO PRESERVE beautiful shade trees along the state highway, by caring for those which now grace the road sides, is one of the duties impressed upon state highway employees.

A fine big sycamore tree, standing along the highway near Capistrano in Orange County, and much used by motorists who enjoyed its shade, was recently the subject of major tree surgery. The big tree had developed a large hole in its trunk which weakened it to such an extent that it was feared a strong wind would blow it down. Maintenance Foreman Hugh Henry removed the dead wood from the hollow trunk and constructed a filling of concrete, weighing about two tons, which has added greatly to its strength. The surface of concrete was roughened and marked to resemble the bark of the tree, and when a



The right of way was shifted to save this tree.



Saved by tree surgery.

little stain is applied to the concrete, it will take a close inspection to detect the concrete substitute.

On the new Foothill boulevard in Los Angeles County, between Monrovia and Azusa, which is now under construction, an additional expense of \$450 was incurred in securing the right of way, in order to shift the highway and avoid the removal of a beautiful oak tree, which has stood for years a landmark of the community.

a capitalization of passenger car operating costs assumed to exceed 3 cents per car-mile.

Exceptional Cases—It must be noted that the preceding arguments are based on present-day average conditions with road speeds averaging from 30 to 40 miles per hour. Road speeds are increasing yearly, a fact tending to increase cost of operation. On a certain proportion of the existing and proposed roads the location and alignment are such as to allow unlimited speeds. But there is a practical upper limit to automobile speeds

determined by considerations of safety, economy, motor design, etc. The railroads of the country have found that 70 miles per hour is about the practical limit for trains. Much higher speeds can be and have been used but have proved impracticable. It is believed that the upper limit of highway speed will be about 50 miles per hour.

Almost no data on such high-speed operation are in existence, but theoretical extension of various data curves would indicate that the figures in the preceding tabulation

(Continued on page 21.)

Supplementary Budget Is Adopted

A SUPPLEMENTARY budget of state highway projects totaling \$5,083,489.56 was adopted by the California Highway Commission at its September meeting in Sacramento. The projects included in the supplementary budget are planned for construction during the present biennium. A number of these projects will be under way during the coming winter months, and it is expected that this work will be a factor in relieving unemployment during the period of usual seasonal idleness.

The funds with which the work included in the supplementary budget will be financed are derived from unallocated balances in state highway funds which were set apart as a reserve when the original state highway budget was adopted last January, together with savings made on contracts already awarded. The fact that construction costs have run well below estimates makes the use of these funds possible at this time in the opinion of the Highway Commission and B. B. Meek, Director of the Department of Public Works.

The specific list of projects included in the supplementary budget follow:

SAN FRANCISCO TO OREGON LINE

Humboldt County—Arcata to Mad River, grading and surfacing, 3.1 miles, \$145,000; additional funds for construction between Fortuna and Fernbridge, \$16,541.26; Arcata overhead—Mad River bridge, \$110,000; South Trinity River bridge, \$75,000; oiling, crushed rock surfacing and drainage improvement on portions of highway between Mad River and Orick, \$50,000; reconstruction near Mad River, \$50,000.

Sonoma County—Additional funds for reconstruction between Santa Rosa and Willowbrook, \$210,000.

Del Norte County—Elk Valley road to Smith River, surfacing, \$14,000.

SAN FRANCISCO TO SAN DIEGO

San Diego County—Repairs to the Santa Margarita bridge, \$10,725.

Ventura County—Paving exception on Conejo grade, \$545.26.

SACRAMENTO TO THE OREGON LINE VIA MARYSVILLE

Placer County—Reconstruction of Dry Creek bridge and additional funds for reconstruction of Antelope Creek bridge, \$24,776.42.

SACRAMENTO TO LOS ANGELES

Madera County—Califa grade separation, \$110,000. Sacramento County—Oil treating, rock surfacing, between one mile north and one mile south of Arno, \$3,024.

Fresno and Madera Counties—Grading and paving approaches to the Herndon bridge, \$62,000. This is in addition to the \$81,000 heretofore allocated for grading and surfacing and is made to provide funds for paving in lieu of surfacing.

TEHAMA JUNCTION TO BENICIA

Yolo County—Mullen grade separation, state's share, \$65,000 (railroad's share, \$40,000).

SAN LUCAS TO SEQUOIA NATIONAL PARK

Tulare County—Oiled rock surfacing, 5.9 miles, from Three Rivers to Sequoia Park, \$50,000.

Fresno County—Oil rock surfacing, 6.4 miles, Coalunga to Parkfield Junction, \$65,000.

SAN DIEGO TO EL CENTRO

San Diego County—Grading from Cottonwood Creek easterly, \$300,000; paving, Cottonwood Creek to Kitchen Creek, 4.5 miles, \$168,000; Pine Valley Creek bridge and approach, \$55,000. Additional funds for construction, San Diego to El Centro, \$75,000.

TAHOE-UKIAH HIGHWAY (CALPELLA TO CISCO)

Lake County—Oiled rock surfacing, 15.8 miles, High Valley Creek to Abbott Mine, \$120,000.

Nevada County—Grading, Nevada City to Washington road, 14 miles, \$300,000.

WEST OF CLAREMONT TO RIVERSIDE

Riverside County—Wineville grade separation, \$65,000.

REDDING TO ROUTE 1 NEAR ARCATA VIA WEAVERVILLE

Trinity County—Rock surfacing from Weaverville to Grass Valley Creek, 16 miles, \$90,000.

Shasta County—Rock surfacing from Tower House to Dickey's Ranch, 5 miles, \$27,500.

Humboldt County—South Fork Trinity River bridge, \$75,000.

ROUTE 3 NEAR RICHVILLE TO QUINCY VIA FEATHER RIVER

Butte County—Grading and surfacing four miles, Oroville to Feather River, \$120,000.

SAUGUS TO ROUTE 11 AT ALPINE JUNCTION

Alpine County—Markleeville Creek bridge and approach, amplifying funds in present budget, \$5,000.

Kern County—Grading and oil rock surfacing, 16.8 miles, Mojave to Cinco, \$168,000; grading and oil rock surfacing five miles north of Ricardo to Freeman, 10 miles, \$100,000.

SAN BERNARDINO TO EL CENTRO

Imperial County—El Centro to Brawley, 20-foot pavement 9.8 miles, \$394,000; resurfacing of one mile through town of Imperial, \$35,000.

EL CENTRO TO YUMA

Imperial County—Additional funds for construction of the Araz underpass and approaches, \$3,517.63.

RED BLUFF TO NEVADA LINE VIA SUSANVILLE

Lassen County—Two miles east of Westwood to Coppervale, grading and surfacing, four miles, \$40,000. Doyle to Long Valley Creek, grading and surfacing, nine miles, \$70,000; two bridges over Long Valley Creek, \$25,000.

PACHECO PASS (CALIFA TO ROUTE 2 NEAR GILROY)

Madera County—Ash Slough bridge, \$38,500; Berenda Slough bridge, \$24,000; approaches to above, \$9,600.

BAKERSFIELD TO PASO ROBLES

Kern County—Amplifying funds for pavement from two miles west of Wasco to Famosa, 8.9 miles, \$105,000; Galloway Canal bridge, \$7,500.

AUBURN TO NEVADA LINE NEAR VERDI

Placer County—Seal coat surfacing, 17 miles, Auburn to Colfax, \$85,000.

Nevada County—Additional funds for construction between Donner Monument and Tahoe Junction, \$21,000.

(Continued on page 22.)

Development of the Right of Way

By H. D. JERRETT, Right of Way Agent, District III.

THE "RIGHT OF WAY" a term used in engineering projects such as railways, electric and telegraph lines, canals, and highways, means a right of passage over another person's ground. It appears to have originated at Melbourne, Australia, where in laying out the city, narrow passages subject

to a right of way were left through the lots from one broad street to another. Hence the term came to be applied to the passages. It is now universally used in referring to the narrow strip of land upon and along which is constructed such engineering enterprises as heretofore mentioned. In a legal sense, it is a positive easement, or that right which involves active physical use of the land, falling short of ownership in the land itself.

There are three essentials in securing the right of way: It



H. D. JERRETT.

must be secured by deed or other form of title before the actual construction of the enterprise can proceed; it is especially important to secure the exact location; and, it must be carefully secured as regards the terms and conditions between the parties.

With reference to the first: All right of way transactions involve a number of legal considerations, some of which are simple, and others of which are extremely complicated. The difficult questions of titles and contracts have very little to do with engineering requirements, and sooner or later legal knowledge is necessary in right of way negotiations. If a legal foundation is not laid at the outset, it will lead the parties to negotiations into later misunderstandings. Hence, the frequent statement that the work of securing the right of way is distinct in itself, and pertains to the functions of the real estate or legal departments of an organization. The very foundation of the right of way is involved in the surety with which one possesses the property.

The next essential and one important in securing the title is the description of the land desired for the right of way. Many difficulties and many disappointments arise in the transfer of land from inaccurate or inadequate description of property which the deed is designed to transfer. The title of the right of way may be all right, but the question often is, where is the right of way? If unsettled this complicates the question particularly as regards encroachments. To illustrate this we need look no further than the congressional grants to the railroads. It is safe to say not one in ten of the railroads of our country has any permanent markings of its center line. I am convinced that the same is true of many of our highway systems. The fence line marks the boundary, but the fence is gone.

Fortunately the old custom of securing right of ways by agreement preliminary to starting the enterprise, with a description resulting from the final surveys, has practically disappeared and well it should. Nothing could be more troublesome and unsatisfactory than this method of securing title for right of way. It was well characterized as a "roving commission to take possession of the farm."

Now negotiations can be begun on a basis determined by actual location and determination of grade, which will eliminate all misrepresentation and trouble.

The third essential is one that involves the engineering department and should be strictly guarded by the chief engineer, for nearly all contracts regarding rights of way pertain to such details as extra widths for deep cuts, borrow pits, spoil banks, fencing, moving buildings, cattle-passes, and crossing privileges and many other conditions that would add to the cost of construction, and in many cases act as an obstruction to the proper use of the way. No contract regarding these matters or kindred subjects should ever be entered into without the chief engineer's approval.

It is right and proper that the legal head should understand that his part of the work is properly confined within certain limits. The same is true of the engineer. It is the right and duty of the engineer to locate the line, to have the direction as to what property is needed, to approve all contracts pertaining to the same, and to prepare the descriptions for the deed. If printed forms are pro-

vided then the deed may be made up in his office, and submitted to the attorney that he may certify to its correctness as a legal document, one that would transfer a good title. This method would prevent any trouble in rights of way on account of the looseness with which descriptions in deeds have been drawn.

The importance of the right of way has seldom received the attention it merits. This has been largely due to the fact that property owners have generally been only too glad to promise the right of way in order that the highway, or railway, might be built, knowing how much the value of their property would be enhanced thereby. On the other hand those responsible for the enterprise have had in view the rapid, and at the same time economical construction of their project and have not always taken the precaution to secure the necessary title to the property occupied. The result is that after the lapse of years during which the property has by reason of construction of the highway or railway through it, largely increased in value, the owner fails to remember that he gave the right of way; and, if he is forced to it, he remembers also that there were certain conditions as consideration for the grant with which the officials in charge have failed to comply; or that the right of way has not been located through his property along the line he was given to understand it to be. In many cases, in collusion with a lawyer, he attempts legal action, or creates an uproar throughout the neighborhood, the effect of which many times is severely felt in the further development of the enterprise.

Again, it develops in later check-ups, that there is a considerable amount of right of way for which no settlement has ever been made, and in this, the only thing the parties in charge can do is to compromise as best they can.

It is gratifying to know, however, that during the last few years, particularly since the rapid development of the highway systems of our country, the importance of the right of way has received more attention. This change has been brought about through the fact that the law places every safeguard about the ownership of real estate. It is now almost a sacred act to come into possession of such title. The owner has come to realize this. The old roads and lines of transportation were in a condition of flux. Property owners as they builded their homes and cultivated their lands adjusted themselves to the conditions as they were. Now any changes in conditions must be made carefully, and even then, they may not be made without some difficulty.

It having been determined to connect two points called termini with a railway, or highway, and the final location, by proper surveys having been completed, the next important step is that of securing the necessary right of way. Here the opportunity presented itself for some one to specialize and devote his time and attention to this important work. Thus there very naturally has arisen a type of individual whose time and attention are very largely devoted to ascertaining the present and prospective value of lands, and the crops, buildings, timber and minerals thereon; to enlist the interest of the numerous land owners; and finally to secure the necessary rights either by gift or purchase. From the very nature of the work such individual has been given the title of right of way agent.

The right of way agent then, is the connecting link between owner and purchaser. To a certain limited degree, any one possessing good business judgment may carry on the work; but to attain any considerable degree of success the individual must be gifted with faculties comparatively rare in combination.

He must rely for his success primarily upon the establishment of some good system which keeps him constantly in touch with every case assigned to him. He must depend, to close a case, upon the following elements: His personality; ability to judge character; presentation and avoidance of misstatement; perseverance in the right direction; securing a balance between what the owner will take and the purchaser will give; and ability to draw up and secure the necessary papers the instant the two minds are in agreement.

In purchasing rights of way the personality of the agent enters almost immediately and continues to be the factor throughout. Whether he will secure the right sought often depends upon his personality—the way he impresses the property owner at the first meeting. Here is where the agent's ability to judge character enters, for until he becomes better acquainted with the party he is dealing with he is forced to judge by the party's exterior characteristics.

Sometimes a man can live down first impressions, but any unfavorable impression is a handicap and therefore puts a useless obstacle in the way. In general, the personality of the agent should create the impression that he is a solid, intelligent man with plenty of energy and perseverance. He should avoid any eccentricity of raiment that would create the impression that he is sporty or frivolous. Moreover the agent must be able to make friends, be a man who has ideas, conversant with general topics, and whom, there-

The Serra Grade Separation

By L. M. RANSON, Assistant District Engineer.

ON AUGUST 3, the contract between San Juan Creek and Serra in Orange County, was completed. This project involved a notable change in the line and grade of both the state highway and the Santa Fe Railway, which shifted its tracks to make possible the safe junction of the two state highways.

Two subways at this point were determined upon because of the heavy traffic over the coast highways, which had to be properly cared for at this junction, to obviate dangerous congestion.

LAST LINK COMPLETED

The completion of this grade separation completes the last link in the state highway



Placing slope paving in north subway.

system on Route 60, between Long Beach and Route 2, leading to San Diego, California.

COST IS SHARED

The cost of this grade separation was borne jointly by the Santa Fe Railroad Company and the state.

The agreement between the state and the



Another view of south subway.

railway company as approved by the State Railroad Commission was as follows:

“(a) The Highway Commission shall bear 60 per cent and the railway company 40 per cent of the cost of the North bridge.

(b) The Highway Commission shall bear 75 per cent and the railway company 25 per cent of the cost of the South bridge, including foundation, excavation, concrete abutments, steel span, docking for span, and all necessary labor incidental thereto.

(c) Each party shall pay 50 per cent of the cost of all track work and the necessary grading for the change of the



Looking west from south subway.

line of the railroad and all other work incidental thereto.”

WILL AID TRAFFIC

The completion of this contract means that a heavy volume of traffic is now using Route 60 along the coast instead of following Route 2 through San Juan Capistrano and Santa Ana.

Owing to the county road detour which involved the fording of San Juan Creek and



Looking west, showing south subway in center; north subway, upper right hand corner; Orange-2-A line lower right hand corner.

a dangerous grade crossing of the Santa Fe Railway, through traffic was not using Route 60 to any appreciable extent. The south underpass of the Santa Fe was thrown open to traffic in the evening of July 3d, affording the holiday traffic use of the coast road through Laguna Beach.

DETAILS OF WORK

This contract involved, on the part of the state, the grading and paving of 0.6 miles with Portland cement concrete and 0.4 miles graded and paved with bituminous macadam. Also 90,000 cubic yards of excavation was involved in the contract in addition to other contract items, which included 560 cubic yards of slope paving.

A 200-foot curve in the highway line was superseded by one of 550-foot radius, super-elevated. This was made possible by cutting down the bluff at that point, the excavated material being used to raise the grade of the railway tracks. The shifting of the location of the railroad and a raise of nine feet in the grade, made possible a contraction of the two subways. These crossings consisted of concrete abutments with steel girder bridge construction, each subway having a clear roadway width of 40 feet. The curve leading through the south subway in the direction of San Diego has a radius of 750 feet and the one leading northward toward San Juan Capistrano has a radius of 900 feet.

The contract was awarded to the V. R. Dennis Construction Company on April 13, 1927, and final acceptance was made by the Director of Public Works on August 18, 1928.

The concrete pavement was constructed with the thickened edge, using the 9-inch—7-inch—9-inch section. The macadam pavement had a 4-inch water-bound base, Type "A," with 2-inch bituminous macadam surface, Type "C." Owing to the water conditions adjacent to this work, it was necessary to provide adequate facilities for removing surface drainage from the subways. This was provided for by the installation of a drainage system, consisting of approximately 350 lineal feet of 18-inch heavy reinforced concrete pipe, with a 5 by 5 Type, American Vertical Centrifugal Pump. This pump is driven at a speed of 1150 revolutions per minute by a 10-horsepower U. S. 60-cycle, 220-volt, 3-phase, electric motor, driving the pump by means of flexible coupling. The pump is equipped with a 5-inch suction pipe and a 6-inch discharge pipe, the automatic control consisting of a General Electric motor, starting switch and float switch. In addition to the electrically driven pump, there is an auxiliary pumping unit, consisting of an American 5 by 5, horizontal centrifugal pump, driven at a speed of approximately 900 to 1000 revolutions per minute by Noxy type, 12-horsepower, water-cooled, multicylinder engine.

The furnishing and installation of the reinforced concrete pipe drainage system with necessary excavation and Portland cement concrete, was placed under contract with F. H. Vehring, Long Beach, California. The pumping equipment cost approximately \$2,000 and the Vehring contract was approximately \$4,900. The contract price for the grading and paving with sloped walls under Contract 521 was \$86,935.50.

Work was carried on under the supervision of District Engineer S. V. Cortelyou. J. B. Hodges was Resident Engineer and Ralph D. Kinsey, Assistant Resident Engineer.

\$30,000 Contribution Is Made to Joint Highway District

A contribution of \$30,000 to Joint Highway District No. 8 was announced by the California Highway Commission following its meeting in Sacramento on September 6th. The contribution was made by the state to the Joint Highway District on the recommendation of B. B. Meek, Director of the Department of Public Works. It will assure the construction of a connection between the new Sears Point cut-off road and the present Sacramento highway near Vallejo. An appropriation of a like sum has already been made by the boards of supervisors of Solano and Marin counties. These counties constitute the Joint Highway District.

Had it not been for the contribution made by the Department of Public Works, the appropriation of the two counties would have reverted to their respective treasuries.

The road to be constructed extends for two miles from the new Sears Point cut-off to a point north of Vallejo. It constitutes a short cut for travel bound from and to the Sacramento Valley from the Redwood Highway and from San Francisco via Sausalito. In the event that a state highway is constructed in the American Canyon in Solano County, which lies east of the present Vallejo road, the cut-off will constitute an important connection with this new highway.

Boards of supervisors of Marin and Solano counties, the city of Vallejo, numerous organizations and many private individuals were most urgent in their request that the state contribute to the Joint Highway District because of the importance of the projected road, both to neighboring cities and counties and to the state as a whole.

Some hesitation was felt by the Department of Public Works toward contributing to the Joint Highway District fund because travel using the road is pointed toward two toll bridges. Mr. Meek reiterated the opinion of his department and of Governor Young that toll roads and toll bridges should not be constructed on through traffic lines, and that the toll method of financing bridges and roads is archaic and justified only when all other methods of financing failed. All toll bridges and toll roads designed to carry through travel, Mr. Meek declared, should be made free at the earliest possible moment.

Pioneer Trail Now State Highway

By ELEANOR LEE READING.

The California portion of the Yellowstone Cut-off consists of the Redding-Alturas lateral and the road north from Alturas to the Oregon line near Lakeview. At a meeting of the Yellowstone Cut-off Association held in Redding, Miss Eleanor Reading read the following article telling of her grandfather's pioneer trip over the trail that this highway now follows. Miss Reading concludes her article with the sage observation that transportation then had one advantage over motoring, in that when the horses died they could be used for food, but when a battery now "goes dead," the "modern steed" does not offer a very appetizing diet.

MY GRANDFATHER, Major P. B. Reading, headed the first party of white men to cross the mountains into California by what is now the Yellowstone Cut-off. He kept a diary of the entire trip, making daily entries, always with his rifle at his side.

In May, 1843, exactly eighty-five years ago, he crossed the Missouri River with a wagon train of two hundred and fifty people, most of whom were bound for Oregon. In crossing the plains they had many interesting experiences, thrilling adventures and terrible hardships. Many times they were without food, sometimes due to scarcity of game, yet at other times they had an abundance of fresh meat but were unable to cook



Major P. B. Reading,
pioneer trail finder

Eleanor Lee Reading



Beautiful Burney Falls on the Yellowstone cut-off.

it because of the absolutely barren country and the wet weather, making it impossible for them to build a fire. Grandfather wrote that it was very tantalizing to be nearly starving in a camp full of meat.

Upon reaching the Platte, they found the river one mile wide and five feet deep, just barely too deep to ford, so they were delayed a number of days killing buffalo and making boots with the hides.

They passed Fort Laramie and crossed the Continental Divide at a point slightly south of Yellowstone Park—being very enthusiastic over the rugged cliffs, deep gorges, beautiful waterfalls, and unusual terraced hot-springs. The Oregon party left them at Fort Hall, heading for the Columbia River. Grandfather and twelve others proceeded to Fort Boise, seeking what they believed to be the

most direct route to California. The fort was then a 150-foot square adobe structure, used by the Hudson Bay Company as a trading post. It was in charge of Capt. Payette, who gave them a warm welcome, and very generously divided his limited food supply with the party. He warned them that the Indians west of there were very hostile, and that such a small party of men would be in great danger. They estimated that it would take them thirty to thirty-five days to reach the Sacramento Valley. It was then October, and the Sierras were covered with snow, so it seemed a daring adventure to try to cross the mountains by an entirely unknown route, but they had such implicit faith in the proposed course that they started out, each with a saddle horse and a pack animal, with only fifteen days food supply.

Game was very scarce and by the end of the fifteenth day their supplies were completely exhausted. On the fifth day following, they killed a small antelope, but were soon starving again. One notation in the diary shows that they had only one handful of antelope grease for the day, with no food at all for the next four days.

They followed the identical route of the present road, and were greatly impressed with the scenery, especially after reaching the Pit country. Grandfather described the magnificent cliffs of Pit River Canyon, the distant view of Mt. Shasta, and a very beautiful waterfall which was evidently Burney Falls.

They had hoped to be able to trade with the Indians for food, but they were very wild and fled at the approach of the white men. The natives lived in large holes in the ground, covered by a lattice of limbs and sod, with a three-foot opening which served as both door and chimney.

From there they followed a southwest course, but had to return to the Pit River after being without water for thirty hours. Realizing the danger of the situation (the canyon being a trap), but there being no alternative, they descended the cliff. In a few minutes they were attacked by Indians, but no lives were lost and they finally succeeded in driving them away. However, the following morning they found that most of their horses had been killed, and as they had been without any food for many days, they butchered and ate them.

As they neared the valley, game became more plentiful, and they found grizzly bear so numerous that they had in some places worn paths five and six inches deep. They reached the Sacramento River on November 3d, and their joy and thanksgiving was pathetic. It had been exactly one month

"GRUMBLER" PRAISES EFFORTS OF STATE HIGHWAY WORKERS

[From the Los Angeles Times.]

GOOD WORK, BOYS!

LOS ANGELES, Aug. 4.—[To the Editor of The Times]: Please allow me space for a word of appreciation and commendation to the crew of the State Highway Department that has for the past couple of months been doing patchwork on Foothill Boulevard between Pasadena and Arcadia.

As the proof of the pudding is in the eating of it, so the proof of good highway patchwork is riding over it. These men patched several miles of that highway where it was like a wash-board and did the work so well that as you ride over it you can not tell where the patch begins and ends. And it is not just chance, because they have laid down hundreds of these patches and they are all alike.

The State Highway Department is to be congratulated on this work. It is a treat to see public work so well done. It might be well for the city and county to send their men out to see how it is done. No, I am not connected with the State Highway Department, nor am I in that line of work at all. I am ordinarily a grumbler, but willing to give the devil his due. I will do some first-class A-1 grumbling in later letters to you.

GRUMBLER.

since they left Fort Boise. They followed down the east bank of the river to Sutter's Fort at Nueva Helvetia (now Sacramento), where they were the guests of General Sutter.

He returned to Shasta County to take up a tract of land that had been presented to him by the Mexican government. This tract retains the name of Reading Grant and comprises 27,000 acres of which this city forms a small portion. The spelling of the name of the town was later changed in order to avoid the confusion of the frequent mispronunciation, and also to honor a Mr. Redding of San Francisco, a lawyer of the Southern Pacific Company, who was instrumental in bringing the railroad through this city.

He later made a trip to Washington City, where he met and married my grandmother. She returned with him to Shasta County, where they made their home until the time of grandfather's death.

In closing, I might mention that my grandfather had *one* advantage over the modern motorist—when his horse failed as a means of transportation, it furnished a food supply that saved him from starvation; but in these days, if you kill your engine and your battery goes dead when you are miles from anywhere, I don't believe you would find the modern steed a very appetizing diet.

Seven Years of Highway Landscaping

[Editor's Note.—The following article telling of the policy of Massachusetts in landscaping its highways will be of interest in California because of the increased interest to this state in highway beautification. The article was written by N. C. McCloud and was published in a recent issue of the Highway Magazine.]

TOURISTS motoring through Massachusetts find unfailing sources of admiration and delight in the roadside beauty of the state's thoroughfares. The general effect is that of a continuous garden plot wherein ragged edges and scarred slopes have no participation. Backyard practices, treating roadsides as things of minor importance, have been discarded by the Massachusetts authorities and supplanted by careful treatment which lends new charm to these borderlands of pleasure travel.

The Bay State policy recognizes roadside beautification as a vital part of highway betterment, demanding the same attention that is given road construction itself. In pursuit of this belief the state department of public works has proceeded with a definite program of activity dating back to 1921. The logical results of seven years entitle Massachusetts to foremost rank as a pioneer in this particular type of improvement.

The new state highways of Massachusetts have a standard right-of-way width of sixty feet, which affords abundance of room for landscaping the space on each side of the traveled portion. State legislation empowers the road authorities to improve the roadsides through such plantings, care and replacements as may be required. In applying the law on the subject, the department of public works has utilized vacant space along the highways for ornamentation through the cultivation of natural growth and the introduction of decorative plantings. Flowers, trees, vines and shrubs from state nurseries are planted in abundance to enhance the beauty of the wayside.

These improvements are conducted by the maintenance division of the department, and the cost is included in the regular expenditures for upkeep. The liberal scale on which the work is undertaken is indicated by the operation of extensive nurseries at Palmer, where trees and plants are propagated and where the working forces are trained in the care of transplanted growth and in the gen-

(Continued on page 16.)

Association Labors

To Keep the State

Highway Beautiful

Honorable B. B. Meek, Director,
State Department of Public Works,
Sacramento, California.

DEAR MR. MEEK:

Knowing of your very sincere desire to see the highways of the state beautified and attractive, and also your desire to see the best of accommodations and facilities for tourists and vacationists along California's highways, I am sure you would be interested in the work of the Auto Camp, Garage and Service Station Unit of the Redwood Empire Association, which was organized as a subsidiary over a year ago.

The functions and objectives of this organization are indicated on the enclosed. Enclosed, also, are copies of correspondence which has been sent out to our own members relating to cleaning up camps, improving sanitation facilities, and, in general, raising the standard of operation.

One thought that we have always had in mind is to induce camp owners and operators, also garage and service station people, to erect their buildings and set up their places of business as far away from the highway right of way as practical in order not to encroach upon the scenery and to avoid the additional traffic hazards which buildings flush on the edge of highway rights of way always create.

It is our desire to offer to the traveling public throughout the Redwood Empire not only diversified accommodations fitting every purse and every idea, but also absolutely clean, attractive, and in some cases odd and colorful stopping places.

If we can be of any service to you along these lines, please do not hesitate to call upon us.

Cordially yours,

RALPH HERRICK,
President Redwood Empire Association.

P. S.—We hope to frame some legislation affecting camp operation and sanitation and will appreciate your cooperation when the time comes.

The following letter was addressed to fifty-eight community organizations and boards of supervisors in the nine counties of the Redwood Empire.

"For three years officials of your Redwood Empire Association have been carefully watching the growing nuisance of promiscuous posting of all manner and type of signs along the highways in the Redwood Empire, which have been destroying the beauty and attractiveness of the scenery.

"Many of these very unsightly signs are being posted on redwood trees and in other spots, which not only hide the natural scenery, but create a feeling of distaste in the minds of tourists and vacationists.

"It seems high time to eliminate this evil, which is a fast growing influence militating against travel increase in the Empire.

"Your association has collected a series of clippings indicating the feeling of various newspapers, also city, county and state officials in other parts of the state and in other states. There seems to be a universal movement to eliminate this promiscuous sign evil, which is ruining the natural scenery."

SEVEN YEARS OF HIGHWAY LANDSCAPING

(Continued from page 15.)

eral work of roadside beautification. The entire program is superintended by the state highway landscape supervisor.

A DEFINITE PLAN FOLLOWED

Haphazard activities have no place in the Massachusetts policy. The completion of a construction job is followed by landscape planning in the hands of skilled engineers. For the guidance of the roadside forces a plan of treatment is worked out on blueprints carrying colored crayon markings to indicate the character of the planting at each particular spot. These designs show the planting crews where to place each tree, plant, vine, or shrub. The result is a borderland which fits the environment.

The policy demands that the designers shall follow natural tendencies in every detail. Local soil conditions are studied as a means of selecting the growth that will thrive best in each locality. Plantings of growths foreign to the Massachusetts landscape are not permitted. The Colorado spruce, for example, is dismissed as something of inherent beauty but out of place in the New England environment. The authorities have taken a determined stand against imported species obviously artificial and failing to reflect the personality of the commonwealth.

Seven years of concentrated activity has transformed Massachusetts roadsides into something to which the state points with becoming pride. At one place the visitor finds a border of flowering honeysuckle; near at hand a blossoming elderberry thicket; and in a neighboring spot a border of old-fashioned daisies. Other places hold artistic blendings of shrubs and evergreens, covering a spot formerly offering the bleakness of a bank of gravel or a rain-washed slope of barren clay. The department has found that a dressing of topsoil makes it possible to convert construction scars and unsightly bleakness into pleasing bits of garden, offering an assortment of plants and blossoms which changes the entire prospect.

The barren reaches of Cape Code are brightened by luxurious borders of beach plums which make the drive among the sand dunes a thing of unforgettable delight.

The roadside policy of Massachusetts possesses a practical aspect that is not to be disregarded, in that the nursery plantings and landscape work serve the useful purpose of preventing

soil erosion and washouts, with resultant savings in the cost of highway maintenance. Countless spots which offered an open invitation to erosion have been covered with vines, clover or shrubs, to the perpetual advantage of the taxpayer in the matter of upkeep.

A phase of the work that may be regarded as no less important than the new plantings is that which involves the use of the axe and pruning knife in treating existing growth and promoting satisfactory development. Trees with mangled trunks and branches are removed in the interest of attractive appearance and to permit the better expansion of surrounding vegetation. Pruning and shaping are applied to unsightly and ill-shaped growth, accompanied by tree surgery for the repair of mechanical wounds and open cavities. Telephone wires and poles are taken down and the wires concentrated in unobtrusive roadside cables, to the distinct improvement of the skyline. Board fences are cloaked by plantings of shade trees arranged with studied avoidance of straight lines and uniform spacing, in simulation of natural forestation.

In dressing up its roadside landscape the state has adopted a plan of softening the harsh lines of white-washed stone pillars placed at danger points for the protection of traffic. The stark stiffness of these markers has been relieved by giving them a background of vegetation which does not interfere with their visibility but which gives the pleasing effect to be expected in a well-tended garden. Roadside springs, as well, have been dressed up in attractive fashion which makes each of them an invitation for the tourist to stop and be refreshed. Benches are provided at frequent intervals and a bid for public neatness is extended through the presence of barrels for the receipt of picnic rubbish and other debris. The suggestion of good housekeeping is everywhere apparent.

SCENERY GIVEN A CHANCE

Perhaps the crowning touch of the Massachusetts program from the viewpoint of the tourist is afforded by the attention devoted to the opening of scenic vistas along the highways. The state authorities feel that the engineer can not be expected to locate his road with regard to scenery alone, and that his task is completed with establishing the grades and curves that are to be followed. The task of bringing the scenery to the highway is that of the expert in landscaping effects. The extent to which this policy has been followed in Massachusetts is a revelation to the sight-seeing tourist who has had the frequent experience of passing fine views that could not be seen from the channel of travel.

Until recently the highways passed through scenic beauties entirely hidden from the traveler who stuck to the main thoroughfare. The visitor might have been within a few feet of a splendid panorama without suspecting its existence.

In today's scheme of beautification this condition does not prevail. Landscape artistry, as applied in Massachusetts, has selected strategic points where the cutting away of roadside foliage has revealed scenic vistas. In this way the scenery has been brought to the highway and the traveler receives the full benefit of the picturesque environment. This development is especially important in the Berkshire region, where the cleared spaces open vistas of the utmost beauty.

The experience of seven years has enabled the state to appraise the cost of the beautification work, and the officials do not hesitate to say that the expense has been of trivial proportions.

Value of Traffic Lanes Is Shown

By ALMON COONROD.



Hogging the road



vs.

Every auto in its right place.

THE MARKING of traffic lanes on the reconstructed portion of the Foothill boulevard between Cherry avenue and San Bernardino has vastly increased the traffic capacity of this highway. The movement of vehicles has quickened and lines of vehicles waiting for an opportunity to pass a truck or slow moving car are no longer in evidence. This is the thought borne out by observation and illustrated by the accompanying photographs.

Approximately two months lapsed between the time of completion of the pavement and painting the traffic lines. This period afforded an opportunity to observe traffic both before and after the lines were painted and visualize in some degree the value of the lines.

There seemed to be a feeling among the traveling public that the widened pavement was constructed only for their ease and safety. This we agree was part of the purpose, yet some drivers in thorough enjoyment of the wide pavement took more than one-third of the road, often at the inconvenience of faster drivers following in close procession behind them. Vehicles awaited their opportunity to pass or risked an accident in the same way as on a 20-foot or two-lane pavement. The public were not using their highway to capacity and were not receiving the full benefit of their investment in a 30-foot pavement.

The pavement is now divided by white painted lines into three 10-foot lanes. The driver no longer feels his right to half the road but finds plenty of ease and comfort within a well defined one-third of the road and is satisfied. The bold white stripe inspires confidence that a vehicle coming in the opposite direction will not cross the line to meet him in a head-on collision.

With but slight exception all vehicles are seen in the outer lanes, the center lane remaining open for passing. With plenty of passing facilities vehicles now travel far apart and bunching behind slow vehicles is no longer in evidence.

The two white lines were painted over the 9.3 miles stretch from Cherry avenue to San Bernardino at a cost of \$2,076.52. The original 18-foot pavement was resurfaced and widened to 30 feet at a cost of \$186,688.77. This highway could have been resurfaced and widened to 20 feet for approximately half this amount. The third traffic lane, therefore, was an investment of about \$90,000. It follows that by the small cost of \$2,076.52 for painting lines for traffic guidance an investment of \$90,000 has been made to yield its full benefit to the public.

L'il pickaninny,
Looks just like his poppy;
Don't know what to call him,
'Less it's Carbon Copy.

—*Wisconsin Octopus.*

DELAWARE—Combined state and local expenditures on highway improvements for 1928 are expected to total \$3,215,000, about one-third of which is being applied to local roads. The state is supervising 95 miles of grading and paving projects.

MINNESOTA—The maintenance dollar was spent in 1927 as follows: Patrol, 38.3 cents; special work (including snow removal and snow fences), 34.5 cents; repairs and replacements, 15.8 cents; betterments, 6.0 cents; and supervision, 5.4 cents.

ILLINOIS—The state department of public health has joined other states in testing semipublic wayside water sources and giving them a seal of approval. "Safe water" signs will soon greet the thirsty motorist, who may thus be reassured that the well has passed inspection.

Figures Tell Story Of Highway Program During Biennium

At the August session of Governor Young's council, B. B. Meek, Director of the Department of Public Works, reported for the Division of Highways that during the present biennium work to the value of \$15,720,144.97 had been placed under contract or bids had been opened with awards pending. This work is divided between the construction fund and the reconstruction or maintenance fund as follows: Construction fund, \$7,124,900.11; Reconstruction fund, \$8,595,244.86.

Work then under advertisement was estimated to cost \$1,629,000. This work was divided as follows: Construction fund, \$480,000; Reconstruction fund, \$1,149,000.

Mr. Meek stated that it appeared reasonably certain that work estimated to cost \$2,900,000 would be placed under advertisement between the date of the council meeting (August 29) and September 30, 1928, divided as follows: Construction fund, \$1,700,000; Reconstruction fund, \$1,200,000.

HIGHWAY WORK FOR WINTER MONTHS

Projects which can be constructed during the winter months are now being planned. It is hoped that this will aid in providing greater employment during the winter months.

Budget Requests of Governor Young Are Met by Department

The budget requests of the Department of Public Works for the biennium of July 1, 1929, to June 30, 1931, total less than \$10,000 over budget allotments for the present biennium, according to figures made public today by B. B. Meek, director of the department. These figures show budget requests for the coming biennium totaling \$910,886 as compared with budget allotments for the present biennium having a total of \$910,094. This is in accordance with the announced policy of Governor Young that budget requests for the next biennium be kept as closely as possible to the expenditure figures of the present biennial period.

The figures for the 1929-1931 biennium do not include expenditures for highway construction, reconstruction and maintenance as these are financed from gasoline taxes, registration fees on motor vehicles, taxes on highway transportation companies, and federal aid.

The budget of recommended state highway expenditures for the coming biennium is now being prepared. Under the new budget law, which was one of the outstanding enactments of the Young administration, highway projects are budgeted along with all other items of state expenditures. Under the Young budget plan, information as to all highway projects is given the public by the California Highway Commission in advance of their construction or the expenditure of money upon them. The budget for the new biennium will be presented to the legislature when it meets in January.

Maintenance on Redwood Highway Is Commended By Association President

Willits, California, August 28, 1928.

Mr. Ralph Bull,
Chairman, California Highway Commission,
Eureka, California.

DEAR MR. BULL:

I have made a recent trip over the highway from San Francisco to Eureka and I am particularly impressed with the splendid maintenance work being done over the entire route. The new process of quickly laid, oiled and graveled surfacing has facilitated the motorist travel to the extent that the old complaints no longer are heard.

I think your maintenance department should be congratulated on the efficient handling of its part of the highway program.

The portion of the road south of Willits to connect with the paved highway at Cloverdale is in the best condition I have ever seen it.

Sincerely yours,

EDWARD MORRIS,
President, Redwood Empire Association.

A CONDUIT HIGHWAY

Handling traffic on the approaches to big cities is the problem that is proving hard to solve and congestion, especially on Sundays and holidays, is continually growing worse, preventing many motor car owners from using their cars on those days. Highway engineers state that the 20-foot highway is a thing of the past and that 40-foot roads, under ordinary conditions capable of carrying at least twice as much traffic and at a more rapid pace, are essential to meet the modern demand. New York state, realizing that the public will have speed whether or not road facilities are equal to the demand, has embarked upon its greatest single highway project. This is a 40-foot wide pavement running through 11 towns on Long Island for a distance of 24 miles. The Conduit Highway, as it is called, constitutes the newest offering to speed and safety—the demand of the motorist. —Wall Street Journal.

Among the safety measures adopted by the South Dakota state highway department is a flat "3 to 1" sideslope. Where fills are more than seven feet high, a steeper slope is used, and a guard fence added for protection.

Cause of Highway Accidents Analyzed By U. S. Road Body

DURING EVERY 24 hours of 1928 an estimated average of 2360 persons are being killed or seriously injured on the streets and highways of the United States. The estimated economic loss for the first six months of 1928 was \$350,000,000 exclusive of small property damage and insurance premiums. At the present rate of increase the "Grim Reaper" will exact a toll of 40,000 human lives in highway accidents during 1935. These figures were part of an analytical highway safety report issued by the American Road Builders' Association.

During the first six months of 1928 the American Road Builders' Association estimates that 13,750 persons were killed and 412,500 seriously injured in highway accidents. The toll for 1927 was 26,618 killed and 798,700 seriously injured, a total of 825,318 casualties. At the present rate approximately 27,500 persons will be killed by the end of 1928.

What do these figures show? Do they indicate that the American people are becoming alarmingly careless at the wheel of an automobile or while walking upon the street? Do they mean that modern cars are too fast or too inefficient to be safely operated on our system of highways?

ANALYSIS OF ACCIDENTS

A careful analysis of highway accident statistics will show the latter to be largely untrue. The principal causes of highway accidents it will be shown, are discourtesy and carelessness on the part of both drivers and pedestrians. The statistics prove the following points:

First—That the most important causes of highway accidents where motorists are principally at fault are in order of their importance—inattention, speeding, traffic law violation and intoxication. Of the 26,618 killed in 1927, motorists were at fault in 11,765 fatalities and all but 1882 were attributed to the above causes.

Second—That the most important causes of highway accidents where motorists are principally at fault are: children playing in the street or crossing in violation of traffic law, adult jay-walking, inattention, and confusion. Of the 11,367 deaths caused principally by pedestrians in 1927, all but 1250 were attributed to these causes.

Third—That adverse physical conditions, such as wet streets, defective roads, poor lights and narrow streets, caused but 3586 deaths.

Fourth—That the human factor is responsible for 95 per cent of all accidents.

Fifth—That the human factor which causes highway accidents is largely the result of certain definable physical conditions, such as complex traffic laws, traffic congestion, discourtesy on the part of fellow

motorists, carelessness on the part of fellow motorists, fatigue, physical incompetency, lack of confidence and the improper conduct of pedestrians.

Sixth—That approximately 60 per cent of all fatalities are pedestrians.

Seventh—That more than 30 per cent of all fatalities are children of school age.

Eighth—That accidents involving pedestrians continue to climb in number much faster than accidents involving only motorists.

THE REMEDY

As a result of its studies, the American Road Builders' Association has launched a national highway safety campaign based upon what it believes to be the fundamental principles of highway accident prevention. These principles are in brief:

First—That all cities and communities should undertake local campaigns to educate pedestrian traffic in the principles of courtesy and caution while on the public street or highway. The use of common sense is recommended in lieu of complex traffic rules.

Second—That all states should adopt a system of examination and licensing of motor vehicle drivers.

Third—That the adoption of the uniform codes of state and municipal traffic laws based on the report prepared by the National Conference on Street and Highway Safety is desirable.

Fourth—That the education of drivers in the principles of courtesy and caution should be undertaken in all communities.

Progress Told in Grade Separations On State Highway

Substantial progress has been made in securing cooperation on grade crossings separation projects, so Director Meek reported to the Governor's Council on August 29th.

The following grade separations, with the amounts provided by the railroad and the state, are under contract, advertised or an agreement has been reached with the railroad for division of cost:

Under contract—	Est. cost	R.R. share	State's share
Brighton subway (Sacramento County) -----	\$100,000 00	\$53,000 00	\$30,000 00
(City of Sacramento pays \$16,600.)			
Herdon line change (Fresno and Madera counties) -----	335,000 00	47,600 00	287,400 00
Weimar crossing (Placer County) -----	50,000 00	25,000 00	25,000 00
Two Bowman crossings (Placer County) -----	35,000 00	1,500 00	33,500 00
Araz crossing (Imperial County) -----	32,500 00	10,000 00	22,500 00
Santa Clara overhead (Los Angeles County) -----	70,000 00	10,000 00	60,000 00
Sargent crossing (Santa Clara County) -----	63,336 30	27,867 00	35,469 30
Advertised—None.			
Agreement reached—			
Irvine crossing (Orange County) -----	125,000 +	40,000 +	85,000 00
Spence crossing (Monterey Co.) -----	70,000 00	30,000 00	40,000 00
Modesto line change (Stanislaus County) (Hatch crossing) -----	-----	52,832 00	-----
Wineville crossing (Riverside Co.) -----	125,000 00	60,000 00	65,000 00
Barstow grade separation (San Bernardino County) -----	145,000 00	75,000 00	35,000 00
(County pays \$35,000.)			
Donation to S. P. R. R.—San Jose -----	150,000 00	75,000 00	75,000 00

A total of 3,530,000 cars and trucks were manufactured in 1927, having an aggregate wholesale value of \$2,556,750,000. The average retail price during the year, of passenger cars, was \$953, and of trucks, \$1,053.

Flood Inundates State Highway in Imperial Valley

THE EL CENTRO to Yuma highway was completely inundated on the morning of July 14th following a break in the East High Line Canal near Holtville.

It is believed that the water in the canal was caused to raise through silting up of the channel causing a small stream to flow through a gopher hole or weak place in the canal bank. The rapid erosion which followed soon made an opening large enough to take the



The inundated highways.

entire flow of the canal. The canal was carrying a volume of 1800 to 1900 second-feet of water which amounted to a veritable river and the adjoining fields and the state highway were quickly flooded.

The Imperial Irrigation District acted promptly when the break was reported. The head gates were closed and water was turned from the canal into the Alamo River. At the end of 36 hours the break was repaired, the canal was again carrying water and the highway was made passable.

Occasional breaks in the soft silt banks of the canals in the Imperial Valley are inevitable. The state highways throughout the Imperial Valley have been designed to drain water away as rapidly as is possible in the flat valley lands. Previous to the construction of the state highways breaks in canals of this sort tied up traffic sometimes for periods of weeks.

An inspection of the highway on July 28th and again on August 17th revealed practically no damage traceable to the overflow of the canal. The pavement is oiled gravel of the field mix type.

WISCONSIN—About 400 miles of pavement was completed in 1927, making a total of 2700 miles of hard surfacing on the state highway system.

Historic "Test" Highway Soon to Belong to Past

[From the Pittsburgh Post.]

Giving way before the march of progress as exemplified by the new Hooper subdivision, the test highway of the Columbia Steel Corporation, near the Santa Fe subway is being destroyed by a crew of men employed by the steel company.

The test highway, constructed in 1921, and which cost probably a quarter of a million dollars, as an experiment to demonstrate the value of concrete for roads, and steel reinforcing, is credited generally by construction engineers with having given California's \$200,000,000 highway program its first great impetus.

Incidentally the road experiment which cost the Columbia Steel Corporation and other contributors \$240,000, started Pittsburg on its way as an industrial city.

Men with heavy sledges and with dynamite are now shattering the heavy cement, and it is being hauled away. The tract will be cut up into lots.

The circular highway was built by the Columbia Steel Corporation after its engineers had made investigations of different types of highway at a cost of \$3,600. Later on the California Highway Commission and U. S. Bureau of Public Roads sent observers to watch the tests. The highway was built to parallel actual conditions, and while the steel company was interested in the use of steel in concrete, actually the test was of concrete roads, as the open hearth reinforcing steel manufactured here was not patented. The tests were in charge of John B. Leonard, structural engineer, and the results were later published in an exhaustive illustrated report by the California Department of Public Works.

To make the test the state loaned forty trucks which had been secured from surplus war material, and these trucks were kept in continual operation for 89 days. During that period 7.36 million tons were applied to the different types of highway, and the experiment not only gave valuable road information to future builders, but also important data on the use of trucks and tires.

AN OLD PRAYER STILL GOOD

An Interesting Prayer Dating from the Eighteenth Century. Authorship Unknown.

Give me a good digestion, Lord, and also something to digest.

Give me a healthy body, Lord, with sense enough to keep it at its best.

Give me a healthy mind, good Lord, to keep the good and pure in sight,

Which, seeing sin, is not appalled but finds a way to set it right.

Give me a mind that is not bound, that does not whimper, whine or sigh.

Don't let me worry overmuch about the fussy thing called I.

Give me a sense of humor, Lord; give me the grace to see a joke,

To get some happiness out of life and pass it on to other folk.

EFFECT OF DISTANCE ON AUTOMOBILE OPERATING COSTS

(Continued from page 7.)

should be increased about 15 to 30 per cent for speeds of 50 miles per hour. Therefore it seems that on projects involving unlimited road speeds passenger automobile operating costs may be assumed to range up to 4 cents per mile, but care must be used to base the estimate on the average prevailing speed rather than the maximum speed.

Preponderance of traffic in one direction, heavy grades or curvature, a large proportion of business or commuting traffic and a number of extreme or unusual conditions would modify the figures in the tabulation, which, as shown, apply to ordinary roads with average traffic and ordinary profile and alignment.

Truck Costs—Truck traffic conditions are very different. The table gives the average itemized cost per gross ton-mile for trucks based on observations of about 1000 trucks. As many of the arguments applied to passenger traffic will fit truck traffic, the mileage total of 3.93 cents per ton-mile probably is too high.

The time value effect of distance is tangible, especially as applied to drivers' wages. Grades seriously affect truck costs, and shortening of grade distances is usually desirable. On most roads the proportion of trucks is small, but growing. Operating cost data are obtained more readily than in the case of passenger cars. Truck traffic should be analyzed carefully in each individual case, as freight traffic is analyzed on a railroad, with special attention to commodities hauled, type of trucks, methods of hauling, grades, etc. In the absence of more extensive data, the table furnishes a valuable guide for estimating average truck costs, but each case is a problem in itself, and averages will not apply to trucks as well as they do to passenger cars.

Conclusion—It is suggested again that highway engineers have been too much inclined to base location estimates on assumptions rather than on facts. As far as the item of route distance is concerned this article has attempted to present a brief outline of facts to be used as a foundation for estimates. It is a fact that the total over-all cost of operating a passenger car may well be 6 cents to 12 cents per mile, more or less, but the highway engineer must divide and apportion this total to reach the proper solution of his location problems.

New Mexico Borrows California Type Pavement For Its Arid Highways

How the "California type pavement" is spreading among western states is shown by the fact that New Mexico is now laying this type of "oil-mixed" pavement. In an article telling of the first contract for this type of pavement in New Mexico, the *New Mexico Highway Journal* says in part:

"Early in the summer of 1927 the New Mexico Highway Commission decided to investigate the mix-in-place or 'turn-over' method of treating crushed rock and gravel roads with asphaltic oils.

"California had pioneered in the application of this method. It is true that Wisconsin had treated a short section of road by this method as early as 1923, but either its importance escaped them or they decided it was not suited to their conditions, for there is no record of their having made a further application. Doubtless an ample supply of moisture for the maintenance of their gravel roads has dulled for them the sharp spur of necessity which pricks California, Arizona, and New Mexico on to a search for some method which will keep gravel roads travelable in areas so arid that no ordinary sort of maintenance can keep them fit for travel."

SOME JAPANESE TRAFFIC WARNINGS

One of the problems of motorists in Kobe, Japan, is to control their mirth while reading some of the traffic signs that have been translated into English, according to information received by the American Automobile Association from a prominent surgeon doing missionary work in that country.

One sign, "Hints to Motorists," reads as follows:

"At the rise of the hand of policeman, stop rapidly. Do not pass him or otherwise disrespect him."

"When a passenger of the foot hove in sight, tootle the horn, trumpet to him, melodiously at first. If he still obstacle your passage, tootle him with vigor and express by word of mouth the warning HI HI."

"Beware of wandering horse that he shall not take fright as you pass him. Do not explode the exhaust box at him. Go soothingly by or stop by the roadside while he pass by away."

"Give big space to the festive dog that make sport in the highway. Avoid entanglement of dog with your spoke wheel."

"Go soothingly on the grease mud, as there lurk the skid demon."

"Press the brake of the foot as you roll round the corner to save collapse and tie-up."—*Patton's Monthly*.

Canada ranks third among the countries of the world in automobile registration, with 733,764 passenger cars, 1,503 buses, and 84,953 motor trucks. The United Kingdom ranks second, with 754,284 passenger cars, 21,000 buses, and 248,367 motor trucks. Canada, however, ranks second in population per motor vehicle, with 10.7 persons to every automobile as against 43 persons to every motor car in the United Kingdom.

Horse drawn vehicles are no longer counted by the State Highway Department of Michigan in its traffic census, because they have decreased to a negligibly small number. Nine traffic counts are taken during the year at 456 different stations including one count in winter. Incomplete reports indicate an unusually large volume of winter traffic particularly in the northern counties.

ASK US ANOTHER

The District Highway Engineer is subjected to a variety of demands and requests by the public. Following is an unusual one:

Mr. S. V. Cortelyou, Dist. Eng.,
Los Angeles, California.

My Dear Sir:

As the chief engineer of District No. 7 you likely know some choice locations for auto camp with gas stations, stores and the usual outfit.

Also you may have seen locations that you thought would be ideal for a mountain resort; fishing, hunting, rest, boating, tennis, etc.

Kindly give me a few of the best, telling where they are located and stating the advantages of each location.

I am a retired M. E. minister and would like to build a place in ideal surroundings with my son. Possibly combine the two features as income justifies.

We will greatly appreciate your careful consideration and beg to remain

Yours very truly,

P.S. Permanent state road very important.

An Old Enemy.

One finds him everywhere he goes—on highway, road or lane,
He who disregards his fellow tourists with disdain.

He who drives disgustingly glancing left nor right
But "rides" the white line in the road—a custom impolite.

His motto is "the road is mine" and "no one shall go past"
And he doesn't seem to hear behind a horn's ferocious blast.

He creeps along at twenty-five till traffic's sadly fussed
And still in the middle of the road sneers "Fellows, take my dust!"

By MAXINE J. STICKLE.

Maintenance Men Praised

[From the Crescent City Courier, August 25th]

A large slide came across the Redwood Highway about five miles south of the Klamath River late Monday afternoon, holding up all traffic and making the highway impassable until about noon on Tuesday.

The maintenance men were highly complimented on their rapid work on the slide, as they were on the job within a very short time after the slide came across the highway, and had a temporary road across the slide early Tuesday morning, which was passable for passenger cars.

INCREASE IN AUTOS

Registration of motor cars and trucks in the United States for the first half of 1928 shows a gain of 1,504,489 or 7.2 per cent, as compared with the same period in 1927. The total registration was 22,248,686 motor vehicles, as against 20,744,197 in 1927, according to the *Oil and Gas Journal*.

"DETOURS"

By PLATT YOUNG

Detours are much like traversed lanes of life:

Congested traffic marks the smoother roads

And rows on rows of heavy-laden loads

Make motor's path a way of care and strife.

Mankind will always choose the beaten way

And follow traffic whereso'er it leads,

Through hamlet, city, peaceful vales and meads,

Nor mind the destined goal, be where it may.

Detours are but adventures. He who dares

Will challenge some inviting, wayside lane

And when within the clearing once again,

A closer kin with Nature he declares.

Heed well the warning over fills and cuts,

And keep the well-worn way. But sometimes blend

A normal swerve with your progressive wend:

Detours of life will lift you out the ruts.

—Georgia Highway.

NATIONAL—Rural mail routes cover 1,270,746 miles, or nearly one-half of our rural highway mileage, states a report from the postal service. They reach 31,698,700 patrons.

NATIONAL—The Atlantic Coast Highway, from Fort Kent, Maine, to Miami, Florida, is one of the world's longest improved highways. Only one per cent of its 2321 miles is yet unsurfaced.

NEW YORK completed more than 500 miles of new pavement on the state highways in 1927. The average width was approximately 20 feet, with a number of routes paved 27, 30 or 40 feet wide.

SUPPLEMENTARY BUDGET IS ADOPTED

(Continued from page 8.)

MYERS TO TRUCKEE, VIA MCKINNEY'S AND TAHOE CITY

El Dorado County—Meeks Creek bridge, \$11,500.

WILLOWS TO ROUTE 3 NORTH OF BIGGS

Glenn County—Quint Canal bridge, \$10,000.

TIBURON TO ALTO

Marin County—Overhead approach at Alto, grading and surfacing, 0.7 mile, \$44,000; Alto overhead, \$40,000;

SANTA MARIA TO FREEMAN VIA BAKERSFIELD AND WALKER'S PASS

Kern County—Grading and oiled rock surfacing from five miles east of Bakersfield to mouth of Kern River Canyon, \$154,000.

MOJAVE TO NEEDLES VIA BARSTOW

San Bernardino County—Barstow grade separation, state's share, \$40,000; railroad's share, \$75,000; county's share, \$35,000.

OXNARD TO SAN JUAN CAPISTRANO

Ventura and Los Angeles Counties—Little Sycamore Creek to Solstice Canyon, pavement, 11.5 miles, \$422,000.

PINNACLES NATIONAL MONUMENT ROAD

San Benito County—To complete a preliminary survey to the Pinnacles National Monument in San Benito County, \$3,500. (Money contributed by the board of supervisors of San Benito County.)

DEVELOPMENT OF THE RIGHT OF WAY

(Continued from page 10.)

fore, his fellow man is glad to meet at all times.

Like every other profession, that of the right of way agent is or should be subject to the same rules of conduct as are applicable to any other vocation. Good faith and truth are fundamental principles, applicable to the relationship of agent, buyer, and owner. In the long run the right of way agent who never loses sight of this fact and practices it will succeed in inspiring confidence, which is the most valuable article of the right of way agent's stock in trade.

Skillful use of facts and arguments which will lead the owner to lower his original price, if it be really excessive, is very essential. Invariably the right of way agent will find the owner "up" in his price. This is natural for the unity of use of his property is in many cases materially interfered with, and many times damaged.

Again the right of way agent should be very careful at all times never to insult or anger the land owner, either by making him feel that he does not know the merits or value of his own property or otherwise.

Above all the right of way agent should never misrepresent facts, as misrepresentation of facts may invalidate a contract, and besides it is best to be honest and clean cut in all dealings. There are many cases of record where the right of way agent has lost a situation and embarrassed his employer by informing the land owner in an off-hand way, without wrong intention, and merely through over-zeal to close his case, that this or that would be done. The one difficulty with the average right of way agent is that he expects to be held responsible for the sum total in dollars and cents only of the cost of securing the right of way. If he comes to an actual case in which it will cost \$1,000 for a cattle-pass, drain ditch, or road crossing for the payment of \$50 or \$100 in cash for the right of way, as the expense of such work goes into the construction account, they outweigh in his mind the advantage of securing the right for \$50 or \$100 in cash. For this reason the right of way agent should not be allowed to make any bargains that would involve the engineering department without the approval of the Chief Engineer or higher official.

There was a time when the conception of securing the right of way was that it consisted of a hypnotic, high pressure, procedure by which the land owner was persuaded,

coerced, frightened, or in any other way compelled to acquiesce in the wishes of the agent. The only consideration in the mind of the agent was how to get the name "on the dotted line." The right of way agent who could successfully browbeat the largest number of land owners was the one who was considered most successful. But that day has passed, and with it the trouble it brought.

A certain amount of system as to deeds and maps is both essential and economical. All deeds should be made in the Engineer's office, and not one should be sent out without being numbered and charged to the person to whom sent for attention. These charges should be made in a book in which sufficient space should be allotted to each deed to allow a full summary of the case from the first move in it until its final settlement. This record should show the name of the project, name of the party to make the deed, number of acres taken, consideration, and when and to whom sent. A careful brief of all correspondence about each case should also be made a part of the record, and a thorough register, carefully kept as indicated, will save much time and labor. All records pertaining to right of way should be kept separate from all other records.

The making of right of way maps for permanent records is a matter that should receive the most careful attention. The trouble with the usual right of way map is that it contains too much that is useless, and too little that is useful.

Upon completion of construction, the right of way map should show all lands belonging to the enterprise, the location of monuments and the character of the title.

The foregoing are only a few of the many changes that have been brought about by the development upon a professional basis of the work of securing rights of way.

Highway Employee Killed

Mr. O. Winters was killed while driving a truck in the Kern River Canyon on August 23d. The cause of the accident is unknown as the truck plunged over the bank when no one was looking.

An interesting piece of road is being built through a swamp near Westport, Massachusetts. The entire stretch is given a foundation of 12 inches of gravel and is surfaced with 8 inches of reinforced concrete, 20 feet wide for most of its length.

As a memorial to the men and women of New York who served in the World War, a road will be built to the top of Whiteface Mountain, overlooking Lake Placid. Eventually a perpetual light will shine from the summit and be visible from all directions for forty to fifty miles.

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B. B. MEEK-----Director
GEORGE C. MANSFIELD-----Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

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DIVISION OF HIGHWAYS DEPARTMENT OF PUBLIC WORKS STATE OF CALIFORNIA

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General Headquarters, Third Floor, Highway Building,
Eleventh and P Streets, Sacramento, California

Progress Reports From the Counties

DEL NORTE COUNTY

The Holdener Construction Company, which has the contract for oiling and surfacing 35 miles of the Redwood Highway from the Oregon line southerly, have completed the 8.4 miles of surface oiling between Patricks Creek and Gasquet, and are now working on the southerly 9.3 miles.

They have two large crushing plants operating and have practically completed the placing of crushed rock surfacing on the 11 miles from Patricks Creek north.

The Holdener Construction Company also has a contract on the Roosevelt Highway northerly from Crescent City for a distance of 21 miles for placing approximately 16,000 cu. yds. of crushed rock surfacing. Their work was approximately 25 per cent complete on the last of August.

John R. Hill, who has the contract for grading and surfacing on the Roosevelt Highway from the Oregon line southerly 7 mile, has practically completed his grading and is now setting up for his surfacing operations.

The day labor work of completing the State Highway from Elk Valley to the new Smith River bridge now being constructed east of Crescent City on the Redwood Highway, is practically all graded and temporary local surfacing is being applied to get the road in satisfactory condition for hauling the bridge steel in to the site.

J. E. Johnston, contractor for the grading and surfacing of the highway between the Klamath River and 7 miles northerly, has made excellent progress in his grading operations and it is expected that surfacing operations will be started as soon as his plant, which is now being erected near the northerly end, is in operation.

Mr. Johnston also has the contract for grading and surfacing 3.5 miles from the southerly Del Norte County line northerly. The grading on this contract is practically complete and surfacing operations are in progress. Traffic is yet using the old county road until the surfacing is further advanced on the contract.

FRESNO COUNTY

Widening roadway, line changes and the construction of drainage structures on Route 10 (Sierra-to-the-Sea lateral) west of Coalinga have made this section into a very good mountain road. This work has been done by day labor under Foreman O. D. Gaston. Surfacing of this road will soon be under way.

HUMBOLDT COUNTY

The Englehart Paving and Construction Company have now sufficiently completed their contract for grading and surfacing the 6.8 miles southerly from the northerly Humboldt County line, that traffic is being carried through without any interruptions whatever on the newly placed crushed stone surfacing, and finishing work is now in progress.

The Hauser contract for grading and surfacing from Orick northerly 8.1 miles, is complete and has been recommended for acceptance.

W. H. Hauser also has the contract for the grading and surfacing of 2.1 miles of Redwood Highway between Fortuna and Fernbridge. The contractor has just moved his equipment from his Orick job and now has two power shovels operating on the new work.

At Scotia, contractors Smith Brothers have completed the clearing and about one-half of the grading on the small line change at the southerly end of the North Scotia bridge.

The placing of plant mix oil surfacing by day labor, between Fernbridge and Loleta, on 2 miles of Redwood Highway, is now in progress and it is expected will be completed by the 10th of September.

INYO COUNTY

The contract for surfacing between two miles south of Big Pine and Tinemaha Dam being done by Montfort and Armstrong, a distance of 7 miles is well along. The base course is now complete and the top course is now being placed preparatory to oiling which will start at once. Several minor line changes were graded by state forces before the above work was started and also all curves were superelevated so that this section of road will be greatly benefited.

The grading to new grade and alignment of that section of road between Diaz Lake, three miles south of Lone Pine and Alabama Gate, a total contract length of 8.5 miles by the Southwest Paving Company, Harry Wilson of Lone Pine having the subcontract for grading and culverts, is about 50 per cent complete. The contractor expects to start erecting his plant for the road surfacing material within the next month and the oiling operations will follow.

The contract has just been awarded to the Southwest Paving Company for the grading and surfacing, oil-treated, plant mix method, of 9 miles from Olancha to Cottonwood Creek, which includes two timber bridges.

Two new additions in the form of wings to the original office building at Bishop have now been completed except for painting the outside. The district forces are now occupying same which greatly relieves the crowded condition heretofore existing.

A reinforced concrete culvert has been completed in Bishop Creek near the north city limits of Bishop, which gives a 40-foot roadway in place of the narrow timber bridge formerly at this location.

At the point where the newly-graded road near Cowan Station crosses the Los Angeles city aqueduct, a reinforced concrete slab bridge is being constructed by state forces which will permit the use of this section of road heretofore blocked off from traffic.

The state forces have now completed the oiling of about 12 miles of road in Round Valley and on Sherwin Hill, oiled shoulders along the oil-macadam pavement north of Bishop, reoil certain sections between Bishop and Big Pine, and are now oiling the shoulders along the 8 miles of 8-foot concrete pavement between Tinemaha Dam and Division Creek. When the state oiling program for this year is completed, there will be a continuous stretch of road oiled or hard surfaced from the Sherwin Hill Summit south to Alabama Gate, near Lone Pine, distance 75 miles.

KERN COUNTY

State forces will soon have completed the new road from the junction of Route 23 to the Walker Pass, a distance of 8 miles. This will be on high standards of alignment and grade and will afford a pleasing contrast to the present narrow winding roadway with its rolling grades.

The improvements on the Walker Pass road west of the summit, made during the early part of the year, have been the occasion of much favorable comment. Further improvements on this section of road are to be made in the near future, including a new bridge over Jack Creek in a new location, which will eliminate the dangerous approaches to the bridge as it now exists.

Widening of roadway and line changes on the Kern River Canyon Highway is progressing rapidly. All dangerous points have been eliminated and curves and grades improved. It is expected to have the road in first class shape before winter.

KINGS COUNTY

A portion of Route 10 west of Lemoore has been surfaced with an asphalt mix. The work was done by day labor under General Foreman B. W. Latour.

LOS ANGELES AND VENTURA COUNTIES

The Southwest Paving Company has recently completed the placing of 11.8 miles of oil treated crushed

stone surfacing between Little Sycamore Creek in Ventura County and Latigo Creek on the Malibu Ranch in Los Angeles County. Their rock plant, where the oil treated California type surfacing was premixed, will not be dismantled until after the completion of the Lewis Construction Company's 1.5-mile grading job between Arroyo Sequit and Los Alisos Creek. It has been arranged to have the Southwest Paving Company furnish premixed surfacing for the latter job, which is nearing completion.

Jahn and Bressi have grading operations well under way on their 11.6-mile contract between Hueneme road and Little Sycamore Creek on the Coast Highway in Ventura County, easterly from Oxnard, where the highway is to be paved with Portland cement concrete.

On the reconstruction of Foothill boulevard between Monrovia and Azusa in Los Angeles County, all culverts are completed and about half of the 40-foot asphaltic concrete pavement being placed is finished.

MADERA COUNTY

The Callahan Construction Company have completed their contract for resurfacing from Herndon to Arcola school.

Construction work on the new Herndon bridge is being pushed by Contractor Carl Peterson.

MARIN COUNTY

Progress is being made by Hanrahan Company on their contract to reconstruct the Redwood Highway from Ignacio to Gallinas Creek near San Rafael. Over three-fourths of the grading is completed; detour bridges and approaches at the several new and reconstructed bridges are opened up to traffic and a 10-foot by 2-inch oil treated strip is being laid on the west side of the existing pavement to accommodate two lines of traffic during construction of the second story pavement which is to be laid in half widths. Two shovels and many trucks and tractors are busy clearing up the work preliminary to paving. A central proportioning plant has been erected at Ignacio and laying of concrete will begin soon.

The removal of the old bridge at Miller Creek and the necessary removal of portions of the bridges at Pacheco and San Jose creeks have been completed and pouring of the deck of Pacheco Creek has also been finished.

MARIPOSA COUNTY

Basich Bros., contractors, have started work on their grading contract in Mariposa County. This work is in charge of Resident Engineer W. T. Rhodes.

Convict work under Superintendent D. M. Lee is progressing rapidly on the Yosemite Highway east of Mariposa.

MENDOCINO COUNTY

The recently completed work as done by the state maintenance forces on the "McDonalds-to-the-Sea Highway" from McDonalds to Boonville has made it possible for two vehicles to pass at most any point. And now the local inhabitants and also the regular visitors in this neighborhood are waiting expectantly for the proposed improvement of this highway by rocking the road and rebuilding major structures.

MERCED COUNTY

Work is expected to start soon on reflooring and painting the San Joaquin River bridge on the Pacheco Pass lateral east of Los Banos.

MONO COUNTY

Coolidge and Scott, contractors from Minden, Nevada, secured the contract for grading about 2½ miles of road between Dogtown and Point Ranch about 6 miles south of Bridgeport. They have a gas shovel, three trucks, teams and other equipment on the work and are making good progress.

State forces are doing good work on the Tioga and Sonora Pass roads, widening the existing roads and making line changes where most needed. Two new log bridges will soon be constructed on the Sonora Pass road eliminating two fords.

The survey of the road from Bridgeport to Coleville is now under way and as soon as the location along the Walker River is completed a state grading crew will be placed on the most dangerous and narrow places bettering the alignment and sight distance.

The annual program of widening and alignment changes on the Tioga road by state forces is affording much appreciated added safety and comfort to the traveling public.

MONTEREY COUNTY

For several years past a consistent program of shoulder improvement has been carried out in the Salinas Valley, waterbound macadam shoulders having been constructed over some 70 miles of highway, followed by the construction of a bituminous macadam armor coat on these shoulders. In the furtherance of this general program, the construction of the bituminous macadam armor coat has just been completed on the shoulders between San Ardo and San Lucas.

The past few years have seen extensive improvement between Coalinga and San Lucas of Route 10, known as the Sierras-to-the-Sea lateral. All portions have been improved to state highway standards except the mountain grade over the Mustang Ridge approximately half way between San Lucas and Coalinga, and extensive improvement of this grade is now being finished by the state forces, including a widening of the roadbed, betterment of sharp curves, and surfacing of the roadway. As a further improvement on this lateral, the portion of road between San Lucas and Mustang Grade has just been oiled.

Rapid progress has been made on the construction of the San Simeon to Carmel Highway by convict labor from the camp at Salmon Creek near the southerly boundary of Monterey County. Over two miles of road has been completed since the camp started operation in April, and the road is under construction for a considerably greater distance.

Preparations are practically completed for the opening of a new convict camp on the Little Sur River approximately 20 miles south of Carmel, which camp, in conjunction with the camp already operating at Salmon Creek 60 miles farther south, will carry forward the construction of the San Simeon to Carmel Highway along the Monterey Coast.

ORANGE COUNTY

The link which connects the Coast Highway through Huntington Beach and Laguna with the Los Angeles to San Diego Highway at Serra has been completed and opened to traffic.

Grading work is nearly completed on the mile of highway north from Galivan, which when completed, will carry traffic over the new overhead crossing of the Santa Fe Railway tracks and eliminate the dangerous grade crossing at Galivan. The new stretch of highway will be surfaced with oil treated crushed stone.

Between Anaheim and Fullerton the state highway, 0.8 miles in length, is being reconstructed and will have 56 feet of Portland cement concrete with curbs. Half of the street is being constructed by Orange County; the other half by the state, all work being under state inspection.

SACRAMENTO COUNTY

Mankel & Staring's contract for grading and surfacing the Arno cut-off between Galt and Sacramento is nearly completed, after being held up for several months due to water in the borrow pit.

The contract for grading and paving with Portland cement concrete from Galt to one mile south of Arno has been approved, and work will start very shortly. The contractor is the firm of Frederickson Bros. and Frederickson & Watson Construction Company. C. M. Butts has been assigned to the job as resident engineer.

SAN BENITO COUNTY

Under the provisions of the act which provides for the making of surveys on county roads by the State Highway Commission upon the request of the counties and the payment of the cost by them, a state highway location party has been making the survey for improvement of the road south from Hollister through Tres Pinos to Palmdine, which is a portion of the road leading to the Pinnacles National Monument. The survey is being made at the request of the county, with the idea of improving this road to the equivalent of state highway standards.

SAN DIEGO COUNTY

All work has been completed on the reconstruction along an improved alignment of two miles of highway between Pine Valley and Buckman Springs on the San Diego to El Centro Highway. The work which was contracted to the Jahn and Bressi Construction Company consisted of the construction of a graded road bed 30 feet wide with necessary pipe culverts, and a 35-foot span reinforced concrete girder bridge, with a 40-foot clear roadway constructed across Cottonwood Creek.

Hauser Construction Company has work well under way on the reconstruction of 7.2 miles of the San Diego to El Centro Highway between Viejas Creek and Guatay Creek. The work to be done consists of constructing a graded roadbed 36 feet wide with necessary drainage structures.

SAN JOAQUIN COUNTY

Remarkable progress is being made on the paving between Mossdale and French Camp. This work is being done by the firm of Frederickson Bros. and Frederickson & Watson Construction Company. We believe that by placing 384 cubic yards in a 16-foot strip of concrete pavement from one mixer in an eight-hour day is a record for this state. We would be interested to hear of a higher. The paving is now complete over three months ahead of the time limit, and will be opened to traffic shortly. This is the main road between Stockton and the San Francisco Bay region. C. M. Butts is resident engineer.

The widening with earth of Cherokee Lane for about five miles from Cherokee Station to Live Oak, between Stockton and Lodi, is progressing rapidly. The contractor, D. McDonald, is handling the grading and has sublet the culvert extensions to the Holdener Construction Company. R. H. Lapp is resident engineer.

SAN LUIS OBISPO COUNTY

Contractor J. F. Collins has just completed the construction of a line change two miles north of San Luis Obispo, which, although short, constitutes a

distinct improvement in the coast highway. It eliminates a double reverse curve, having required a change in the channel of San Luis Obispo Creek, and comparatively heavy grading.

The most extensive piece of highway improvement carried out in San Luis Obispo County in recent years is the reconstruction to modern standards of the coast highway between Pismo Beach and San Luis Obispo. This work, which is being carried on by Contractor J. F. Knapp, is now approaching completion the concrete pavement having been poured and open to traffic throughout. The construction of oiled macadam exceptions where heavy grading was involved and the completion of a major line change recently added to the contract are the only major items yet to be completed in connection with the work.

In connection with the construction of the new camp of the California National Guard near San Luis Obispo, the Adjutant General called on the Division of Highways to construct the roads within the camp area. These were let to a district contract last spring, and work of construction carried through to completion immediately before the occupancy of the camp by the first unit of the National Guard. It is probable that further improvement will be carried out by the Division of Highways at a later date.

SAN MATEO COUNTY

See account of Bayshore Highway project.

SAN MATEO, SANTA CLARA AND SANTA CRUZ COUNTIES

The work being done by Twohy Bros. Co. and J. C. Shea Co., contractors, on the Skyline boulevard extension from the La Honda road to Saratoga Gap, is progressing with a very large crew and much equipment rushing the grading work prior to the heavy winter rains. More than half the excavating has been completed, and seven power shovels are moving approximately 160,000 cubic yards per month. An excellent quarry site has been located and is being developed with the intention of starting the laying of the rock surface about the middle of September.

Clearing right of way has been completed. Also the construction of several timber cattle passes and the corrugated metal pipe culverts are being placed as fills are made.

SANTA BARBARA COUNTY

The Cuyama lateral extending from Santa Maria to Maricopa is being steadily improved to better standards, some 16 miles having recently been oil surfaced, the work including also the addition of considerable gravel surfacing.

SANTA CLARA COUNTY

District maintenance forces have just completed the extension of the 8-foot by 7-foot concrete box at Laguna Creek near Coyote and the construction of a new 12-foot by 7-foot concrete box immediately adjacent thereto. A detour was built around this work and the construction carried on in such a manner as to cause no interference with traffic at any time.

Much favorable comment has reached this office on the excellent manner in which this work was handled.

SANTA CRUZ COUNTY

The maintenance forces are starting the straightening out and widening on 7 miles of the road from Saratoga Gap to Redwood Park.

This section, from the Gap to Waterman switch, the connection with the Waterman road to Boulder Creek,

is extremely narrow, with poor visibility and many hairpin curves. It is proposed to improve the alignment and visibility on this section prior to the opening of the section of the Skyline boulevard, now under contract, by cutting across several of the worst curves and widening the narrow sections to allow of two-way traffic at all points.

SOLANO COUNTY

Larsen Bros.' contract for grading and surfacing the line change back of Cordelia is making good progress. The bridge over Green Valley Creek is complete, except for the guard rail. Jess Cole is resident engineer.

STANISLAUS COUNTY

The south approach to the Stanislaus River bridge near Ripon under contract to C. W. Wood is progressing. This job consists of replacing with earth fill about 300 feet of the old trestle and building three new bents of timber to connect with the concrete arch. Geo. R. Hubbard is resident engineer.

TULARE COUNTY

The Valley Paving and Construction Company were successful bidders on the Tulare to Goshen Junction section of the Valley Highway. The contract calls for widening and resurfacing with asphaltic concrete. H. B. LaForge will be resident engineer for the state on this job.

YOLO COUNTY

Replacing the old guard rail on the wooden portion of the Yolo Causeway is being pushed by P. F. Bender, contractor. H. S. Marshall is acting resident engineer.

The widening with earth and placing oil mix borders on the one and one-half miles east of the Yolo Causeway, D. McDonald, contractor, has been completed. R. H. Lapp was resident engineer.

GEORGIA has 470 miles of asphaltic surfaces on the state highways, to which about 70 miles is being added this year. All of this is on gravel, stone or slag base.

QUEBEC—Maintenance by contract has been abandoned after a three-year trial in which it was found that better results could be obtained by departmental forces. Lack of interest by contractors and uncertainty of quantities involved made canceling of contracts advisable for the present.

SOUTH CAROLINA—Counties which desire may finance state road construction entirely with local bond issue or other funds, under a "reimbursement agreement" in which the state agrees to repay its share when funds become available.

NEW ENGLAND—During the present year the various state and local highway departments will use nearly \$50,000,000 to extend, improve or reconstruct and maintain their highways. Maine will improve 90 miles. Vermont will double its paved mileage. New Hampshire is building 36 miles of new highways and 100 bridges. Massachusetts will apply \$12,000,000; and Rhode Island \$3,500,000. Connecticut will improve 150 miles with a total program of \$15,000,000.

Record of Bids and Awards

ALAMEDA COUNTY—Planning surface of asphalt concrete pavement between Alameda-San Joaquin County line and Greenville, about 10.2 miles in length. Dist. IV, Rt. 5, Sec. A. Engr's Est. \$6,052.84. Awarded to Standard Road Mfg. Co., Los Angeles, \$6,052.84.

BUTTE COUNTY—Between Butte Creek and Biggs Road, 7.7 miles to be surfaced with gravel. Dist. III, Rt. 45, Sec. A. Engr's Est. \$29,492. L. C. & W. E. Karstedt, San Jose, \$18,336; E. B. Bishop, Sacramento, \$20,822; Hemstreet & Bell, Marysville, \$31,937; Daniel Bayles, Biggs, \$35,841; Mankel & Staring, Sacramento, \$19,682; A. F. Giddings, Sacramento, \$19,531; H. H. Peterson, San Diego, \$24,798. Contract awarded to L. C. & W. E. Karstedt.

GLENN COUNTY—Between Logandale and Willos, 5 miles to be graded. Dist. III, Rt. 7, Sec. A. Engr's Est. \$48,860.50. E. T. Fisher, Patterson, \$65,690; Earl L. McNutt, Eugene, Oregon, \$44,406; A. F. Giddings, Sacramento, \$39,043; C. W. Wood, Stockton, \$49,155; Fredrickson & Watson, Oakland, \$26,637.10; D. McDonald, Sacramento, \$35,142.50; C. T. Malcom, Walnut Creek, \$42,951.50; C. R. Adams, Oakland, \$41,992.40. Contract awarded to D. McDonald.

IMPERIAL COUNTY—Through the town of Imperial, 1 mile to be paved. Dist. VIII, Rt. 26, Sec. F. Engr's Est. \$29,490. R. E. Hazard Const. Co., San Diego, \$29,395; Finley Steele, Santa Ana, \$31,590. Contract awarded to R. E. Hazard Const. Co.

INYO COUNTY—Between Olanchito and Cottonwood Creek, 9.3 miles to be graded and surfaced with oil treated crushed gravel or stone. Dist. IX, Rt. 23, Sec. J. Engr's estimates, \$93,281.60 plant mix, \$91,776.60 road mix. W. J. Taylor, Palo Alto, \$96,567.80, PM, \$93,205.30 RM; Nighbert-Cornahan Co., Bakersfield, \$103,391.10 PM, \$96,468.10 RM; M. J. Beranda, Stockton, \$102,853. PM, \$93,823 RM; Holdener Const. Co., and G. E. Finnell, Sacramento, \$111,161.70 PM, \$108,904.20 RM; Robinson-Roberts Co., Oakland, \$101,737.50 PM, \$101,737.50 RM; Dan and Maney, Los Angeles, \$108,938.50 PM, \$105,928.50 RM; Southwest Paving Co., Los Angeles, \$85,753.80 PM, Isbell Construction Co., Carson City, Nevada, \$114,567 PM, \$113,363 RM. Contract awarded to Southwest Paving Co.

LOS ANGELES COUNTY—Bridge across Santa Clara River and bridge across S. P. Tracks with .72 of a mile of grading and paving approach. Dist. VII, Rt. 4, Sec. A. Engr's Est. \$220,185.50. Ross Const. Co., Los Angeles, \$198,424.60; The Western Const. Co., Los Angeles, \$222,563.33; C. E. Green & L. Worel, Los Angeles, \$220,342.28; R. H. Travers, Los Angeles, \$227,565.20; John C. Gist, Arcadia, \$198,408.26; Fredrickson & Watson, Oakland, \$295,087.80; Claude Fisher, Los Angeles, \$193,778.02; McWilliams & Ritchey, Los Angeles, \$238,713. Contract awarded to Claude Fisher.

LOS ANGELES COUNTY—Between San Dimas Ave. and Ramona Ave., 1.4 miles to be graded and paved with asphalt concrete. Dist. VII, Rt. 9, Sec. I. Engr's Est. \$69,867.50. Gibbons and Reed Co., Burbank, \$69,859.30; Griffith Co., Los Angeles, \$63,446.55; Hall-Johnson Co., Alhambra, \$93,530.60; Southwest Paving Co., Los Angeles, \$69,234.92. Contract awarded to Griffith Company.

MADERA COUNTY—Between Madera and Berenda Crossing, 7.3 miles to be graded and surfaced with asphalt concrete. Dist. VI, Rt. 4, Sec. B. Engr's Est. \$163,259.50. Warren Construction Co., Oakland, \$171,612.50; Hanrahan Co., San Francisco, \$142,867; Force Currian & McLeod, Oakland, \$157,267.10; Allied Contractors, Inc., Omaha, Neb., \$163,503.90; A. Teichert & Son, Inc., Sacramento, \$154,804; J. E. Johnson, Stockton, \$170,416.50; Valley Paving & Const. Co., Visalia, \$163,294.75; Cornwell Construction Co., Santa Barbara, \$154,797.50; Jack Casson, Hayward, \$156,575.15. Contract awarded to Hanrahan Company.

MARIPOSA COUNTY—Between westerly boundary and Orange Hill School, 6.3 miles to be graded and rock surfaced. Dist. VI, Rt. 18, Sec. A. Engr's Est. \$207,094.50. Robinson-Roberts Co., Oakland, \$255,886.80; W. H. Hauser, Eureka, \$199,667.50; T. E. Connolly, San Francisco, \$245,158.40; A. Teichert & Son, Sacramento, \$213,208.70; Ward Engineering Co., San Francisco, \$215,455.70; Holdener Const. Co., Sacramento, \$208,027.75; J. F. Collins, Stockton, \$208,164.70; Jasper-Stacy, San Francisco, \$207,484.78; Isbell Const. Co., Fresno, \$233,366.50; Basich Bros. Const. Co., Los Angeles, \$166,748.30; Harlan White, San Francisco, \$235,736.90; C. R. Adams, Oakland, \$198,654; Fredrickson & Watson Const. Co., \$207,829.30. Contract awarded to Basich Bros. Construction Co.

MERCED COUNTY—Repairing bridge across San Joaquin River about 16 miles east of Los Banos. Dist. VI, Rt. 32, Sec. C. Engr's Est. \$20,914. Geo. J. Ulrich Const. Co., Modesto, \$24,500; M. B. McGowan, San Francisco, \$26,894; Carl Nelson, Stockton, \$21,318.08; Stephenson Const. Co., San Francisco, \$19,006.60. Contract awarded to Stephenson Const. Co.

NEVADA COUNTY—Between Donner Lake and Truckee, 2.5 miles to be graded and surfaced with crushed gravel or stone. Dist. III, Rt. 37, Sec. D. Engr's Est. \$37,092.40. Hemstreet & Bell, Marysville, \$45,371; J. P. Brennan, Redding, \$38,994.50; Mathews Const. Co., Sacramento, \$27,983; G. E. Finnell, Sacramento, \$33,335.50; W. J. Taylor, Palo Alto, \$35,306. Contract awarded to Mathews Const. Co.

PLACER COUNTY—Between Sheridan and north-every boundary, 2.1 miles to be widened and surfaced with bituminous macadam. Dist. III, Rt. 3, Sec. B. Engr's Est. \$19,004.50. E. F. Hilliard, Sacramento, \$13,594; A. Teichert & Son, Sacramento, \$14,982.90; E. B. Skeels, Roseville, \$15,290.50; Kaiser Paving Co., Oakland, \$14,819. Contract awarded to E. F. Hilliard.

PLACER COUNTY—Two bridges across Dry and Antelope creeks east of Roseville. Dist. III, Rts. 3 and 17, Sec. A. Engr's Est. \$34,497.88. D. McDonald, Sacramento, \$34,420.75; Peter F. Bender, \$31,640; Stevenson Const. Co., San Francisco, \$31,644.50; Geo. J. Ulrich Const. Co., Modesto, \$28,639.45; Edgar Noble, La Moine, \$34,601. Contract awarded to Geo. J. Ulrich Const. Co.

RIVERSIDE COUNTY—Between 9½ miles west of Hopkins Well and Black Butte, 22.1 miles to be graded and surfaced with oil treated crushed gravel or stone. Dist. VIII, Rt. 64, Sec. C. D. Engr's Est. \$342,450. PM, \$334,554. RM, C. R. Adams, Oakland, \$373,492.20, PM, \$362,212.20, RM; Dillon & Boles Los Angeles, \$347,405.20 PM, \$342,409.20 RM; Holdener Const. Co., Inc. and G. E. Finnell, Sacramento, \$386,082.70 PM, \$380,442.70 RM; Ross Construction Co., Los Angeles, \$368,430 PM, \$379,719 RM; Hall-Johnson Co., Alhambra, \$399,639 PM; Nevada Contracting Co., Fallon, Nev., \$369,630.50 PM, \$369,630.50 RM; Force, Currian and McLeod, Oakland, \$310,885 PM; Robinson-Roberts Co., Oakland, \$376,297.30; \$376,297.30; C. G. Willis & Sons, Los Angeles, \$339,164.40 PM, \$335,780.40 RM; Southwest Paving Co., Los Angeles, \$353,554.80 PM; George Herz & Co., San Bernardino, \$292,899.60 PM, \$313,203.60 RM; Isbell Construction Co., Carson City, Nevada, \$346,141.20 PM, \$351,781.20 RM. Contract awarded to George Herz & Company for \$292,899.60 PM.

SACRAMENTO COUNTY—Constructing 1.8 miles of new property fence and removing and resetting 3.7 miles of existing property fence between Galt and Arno. Dist. X, Rt. 4, Sec. A. Engr's Est. \$2,347.98. Standard Fence Co., Oakland, \$8,386.47; Mathews Const. Co., Sacramento, \$4,060.78; Peter F. Bender, North Sacramento, \$3,899.99; Ed. R. Jameson, Sacramento, \$2,756.62; B. C. Burnett, Turlock, \$4,348.55. Contract awarded to Ed. R. Jameson.

SACRAMENTO COUNTY—Between Galt and 1 mile south of Arno, 4 miles to be graded and paved with Portland cement concrete. Dist. X, Rt. 4, Sec. A. Engr's Est. \$179,357.75. H. H. Peterson, San Diego, \$136,135.25; J. V. Galbraith, Petaluma, \$164,334.90; C. W. Wood, Stockton, \$139,982; Fredrickson & Watson Const. Co., Oakland, \$135,106.25; Dillon & Boles, Los Angeles, \$160,068. Contract awarded to Fredrickson & Watson Const. Co.

SAN DIEGO COUNTY—Repairing bridge across the Santa Margarita River 2.6 miles north of Oceanside. Dist. VII, Rt. 2, Sec. C. Engr's Est. \$11,076. Ross Construction Co., Los Angeles, \$9,750; L. Worel, Alhambra, \$14,400; John C. Gist, Arcadia, \$11,300. Contract awarded to Ross Construction Co.

SAN JOAQUIN COUNTY—Between the Diverting Canal and Cherokee Station, 0.8 of a mile to be graded and surfaced with crushed gravel or stone. Dist. X, Rt. 4, Sec. C. Engr's Est. \$34,290. Willard and Biasotti, Stockton, \$32,661.50; C. W. Wood, Stockton, \$29,792; Cannon & McCarty, Stockton, \$28,220.50; D. McDonald Sacramento, \$29,615; Mankel & Staring, Sacramento, \$39,336; Fredrickson & Watson Const. Co., Oakland, \$29,115; Ariss-Knapp Co., Oakland, \$39,755. Contract awarded to Cannon & McCarty.

SAN JOAQUIN COUNTY—From 3 miles west of Manteca to Mossdale, 2.2 miles to be graded and paved with oil treated crushed gravel or stone. Dist. X, Rt. 66, Sec. A. Engr's Est. \$36,208. Jack Casson, Hayward, \$36,503; Kaiser Paving Co., Oakland, \$41,073; Willard & Biasotti, Stockton, \$32,391.65; C. W. Wood, Stockton, \$32,885; W. J. Taylor, Palo Alto, \$34,198.40; Nighbert-Cornahan Co. Bakersfield, \$41,542.60; Mankel & Staring, Sacramento, \$29,292; A. Teichert & Son,

Inc., Sacramento, \$32,536.90; Valley Paving Const. Co., Visalia, \$34,194.50; Fredrickson & Watson Const. Co., Oakland, \$32,200; D. McDonald, Sacramento, \$32,328. Contract awarded to Mankel & Staring.

SAN MATEO COUNTY—Grading and oil treated rock surfacing 3.5 miles from San Francisco to South San Francisco. Dist. IV, Rt. 68, Sec. A. Engr's Est. \$660,028. Healy-Tibbitts Construction Co., San Francisco, \$935,740; Granfield Farrar & Carlin, San Francisco, \$704,049.50; H. V. Rohl Co., Los Angeles, \$661,373; The Utah Construction Co., Ogden, Utah, \$889,418.80; Marsh Bros. & Gardenier, Inc., San Francisco, \$839,977.60; Calif. Const. Co., San Francisco, \$864,044.80; Nevada Const. Co., Fallon, Nevada, \$796,018.70; Towhy Bros., Co. & J. T. Shea, San Francisco, \$855,744.50; George Pollock, Sacramento, \$730,324; J. F. Knapp, Stockton, \$766,401.50; C. R. Adams, Oakland, \$825,572.20; Kaiser Paving Co., Oakland, \$807,422.49; D. A. Foley Const. Co., Los Angeles, \$1,002,816.50; T. B. Connally, San Francisco, \$888,556.80; Ross Construction Co., Los Angeles, \$797,939; D. McDonald, Sacramento, \$717,238; A. F. Giddings, Sacramento, \$843,371.40; S. H. Palmer Co., Sacramento, \$856,807.40; Wren & Greenough, Portland, Oregon, \$812,967. Contract awarded to H. W. Rohl Co., Los Angeles, \$661,373.

SANTA CLARA COUNTY—Overhead crossing, S. P. tracks at Sargeant, Dist. IV, Rt. 2, Sec. C. Engr's Est. \$70,063.50; The Duncanson-Harrison Co., San Francisco, \$70,195.75; MacDonald & Kahn, San Francisco, \$71,660; Ben C. Gervick, Inc., San Francisco, \$80,553; Jasper Stacy Co., San Francisco, \$84,883; A. W. Kitchen, San Francisco, \$74,837.22; Barrett & Hilt, San Francisco, \$63,336.30; M. B. McGowan, San Francisco, \$78,480; Schulord McDonald, Oakland, \$71,293; Fredrickson & Watson, Oakland, \$73,870.25; Healy-Tibbitts Const. Co., San Francisco, \$89,993.25; Butte Const. Co., San Francisco, \$74,416.40. Contract awarded to Barrett & Hilt, \$63,336.30.

SONOMA COUNTY—Between Santa Rosa and Willow Brook 11.4 miles to be graded and paved with Portland cement concrete. Dist. IV, Rt. 1, Sec. D. Engr's Est. \$450,468.25; J. F. Knapp, Stockton, \$428,634.95; J. V. Gallbraith, Petaluma, \$409,452.70; Dillon & Boles, Los Angeles, \$490,142.75; H. H. Peterson, San Diego, \$383,689.50; N. M. Hall, Porterville, \$457,256.75; Prentiss Paving Co., San Jose, \$433,204.95; Hanrahan Co., San Francisco, \$414,816.70; D. McDonald, Sacramento, \$423,892.80; C. W. Wood, Stockton, \$419,398.20; Kaiser Paving Co., Oakland, \$440,989.45. Contract awarded to H. H. Peterson, \$383,689.

TRINITY COUNTY—Two bridges, reinforced, one across Indian Creek and one across Grass Valley Creek, about 40 miles west of Redding. Dist. II, Rt. 20, Secs. A and B. Engr's Est. \$28,275; J. P. Brennan, Redding, \$22,431.22; Edgar Noble, La Moine, \$25,409. Contract awarded to J. P. Brennan.

TULARE COUNTY—Between Tulare and $1\frac{1}{2}$ miles south of the Plaza Garage 6.1 miles to be widened and surfaced with asphalt concrete. Dist. VI, Rt. 4, Sec. F. Engr's Est. \$138,167.30. Hanrahan Co., San Francisco, \$129,830; Valley Paving Co., Visalia, \$119,772; A. Teichert & Son, Sacramento, \$132,476; Allied Contractors, Inc., Omaha, Neb., \$137,643.50. Contract awarded to Valley Paving Co.

TUOLUMNE COUNTY—Unloading, hauling and placing oil treated surfacing between Keystone and Jamestown. Dist. X, Rt. 13, Secs. A and B. Engr's Est. \$13,950; Jack Casson, Hayward, \$11,470; Mankel & Staring, Sacramento, \$10,075; C. W. Wood, Stockton, \$12,400; M. J. Beranda, Stockton, \$12,927; A. Teichert & Son, Sacramento, \$10,850; A. H. Raisch, San Francisco, \$22,940. Contract awarded to Mankel & Staring.

VENTURA COUNTY—On the Conejo Grade, 4 miles easterly from Camarillo, 0.2 of a mile to be graded and paved with class F Portland cement concrete. Dist. VII, Rt. 2, Sec. B. Engr's Est. \$9,950; Sam Hunter, Santa Barbara, \$10,110; Silveria & Robbins, Ventura, \$9,183; H. H. Peterson, San Diego, \$10,444. Contract awarded to Silveria & Robbins.

BUTTE, GLENN, COLUSA, YOLO, YUBA, SUTTER, PLACER, SACRAMENTO AND EL DORADO COUNTIES. Crushed gravel or stone to be unloaded from cars hauled and deposited in stock piles. Dist. III. Engr's Est. \$6,230. A. G. Raisch, San Francisco, \$6,408; Hemstreet & Bell, Marysville, \$7,787.50; J. R. Reeves, Sacramento, \$6,719.50. Contract awarded to A. G. Raisch.

PENNSYLVANIA—Four thousand units of maintenance equipment costing \$4,000,000 are in service maintaining the 12,000 miles under state jurisdiction.

POLITICAL CLASSIC

The *Houston Post-Dispatch* reprints the following announcement of a west Texan for the office of county attorney in his county:

To the Voters of Throckmorton County:

Having been strongly solicited by my wife, I hereby announce my candidacy for the office of county attorney. I shall be opposed in this race by two of your best known citizens, Hon. B. F. Reynolds and Mr. James F. Wright. Concerning them, I shall have nothing to say except that they are upright and honorable men deserving your confidence and support.

Mr. Reynolds came to Throckmorton County before most of us were born, when it represented the last outpost of civilization and lay far out on the edge of the wild frontier. But for such men as he, who came here when every step was attended by dangers and existence meant battle and a march, there would be no Throckmorton County and no county attorney's office to fill. For his labor and sacrifice we are all grateful. A life of noble deeds and great achievements recommended him to the voters. He is my friend and I love him. I have served for the past year, and am at present, his assistant.

Mr. Wright is a native son and was born in the county he seeks to serve. He is capable and qualified to fill the office and is deserving of the trust he asks you to bestow. He, also, is my friend, and should you elect him as your servant, I am sure your confidence would not be misplaced.

As for myself, I am an "Arkansas Hill-Billy," born and raised in the Ozark Mountains. Outran the dogs on Sunday morning to keep from having my face washed—did my sparring bare-footed—never saw a train until I was 15 and was almost grown before I learned that Republicans walked on hind feet like people.

Have farmed with a bull-tongue plow—taught school—practiced law—and am a first-class mechanic, having worked a right smart around a molasses mill. Came to Texas two years ago and married the finest little girl in Throckmorton County. I want the office because I think I can make a living out of it and will promise, if elected, to try and make thieves and bootleggers think hell ain't 40 feet from the courthouse.

So I expect to spend the time between now and the election, kissing babies, complimenting the ladies' cooking and bragging on the Old Man's crop.

Your vote and influence will be appreciated.

JEFF FOWLER.

Boss: "Mike, how did the accident happen?"

Mike: "Well, boss, ye se, 'twas like this: "I was drivin' me truck up State street, when I had to stop suddenly, and a fellow in a big Packard crashed into the rear end of me truck. Shure it didn't hurt his machine very much, but he jumped off and ran up to me, and shakin' his phist, said: 'Hey, you little Harp, why didn't you put out your hand?' 'Put out me hand?' says I. 'Ye dang fool, if ye couldn't see the truck, how the devil could ye see me hand?'"

Enthusiasm is the greatest business asset in the world. It beats money and power and influence. Singlehanded the enthusiast convinces and dominates where a small army of workers would scarcely raise a tremor of interest. Enthusiasm tramples over prejudice and opposition, spurns inaction, storms the citadel of its object, and like an avalanche overwhelms and engulfs all obstacles. Enthusiasm is faith in action; and faith and initiative rightly combined remove mountainous barriers and achieve the unheard-of and miraculous.

Set the germ of enthusiasm afloat in the prevention of accidents; carry it in your attitude and manner; it spreads like a contagion and influences every fiber of your activities; it begets and inspires effects you did not dream of; it means increase in production and decrease in costs; it means joy and pleasure and satisfaction to your fellows; it means life, real and virile; it means spontaneous bedrock results—the vital things that pay dividends.—D. D. McLean in *California Constructor*.

STATE HIGHWAYS IN CALIFORNIA SHOWING THE PRIMARY AND SECONDARY ROAD SYSTEMS AND THE DIVISION OF THE STATE UNDER THE BREED BILL.



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CALIFORNIA HIGHWAYS and PUBLIC WORKS



Official Journal of the Division of Highways
Department of Public Works
NOVEMBER
DECEMBER
STATE OF CALIFORNIA
1928

Holiday Greetings To All!

By E. B. MEEK, Director of Department of Public Works, State of California.

The holiday number of CALIFORNIA HIGHWAYS AND PUBLIC WORKS furnishes proper occasion to extend greetings to those who have been engaged in building and maintaining the highways of California during the past year.



I particularly appreciate the loyalty and devotion to the work that the year has evidenced. It has been a year of strenuous endeavor, and had it not been for the splendid and unselfish cooperation of those associated together in it, the very substantial program of highway construction now under way could never have been launched.



One of the most pleasing features of my connection with the work has been the opportunity that it has given me to become acquainted with the splendid body of men and women upon whom its chief burden rests.



I feel that a great service has been done for California in the past year. The coming year offers opportunity for even greater service.



May the Christmas season bring to all of you the happiness that lies in the consciousness of a work well done.



And may the New Year bring to all of us an increasing sense of the worthwhileness of our work and the importance of our task. May we prove by the merit of our accomplishment the truth of the adage "There is honor in public service."



Hogging the road

vs.

Every auto in its right place.

Give Thanks for Our State Highways; A Message to all of California

By J. P. BAUMGARTNER, Member California Highway Commission.

THE CITIES, the improvement districts, the counties and the State of California cooperatively are constructing the finest system of highways in the world. That is, of course, taking into consideration all the elements of a fine system of highways, such as proportionate mileage, comprehensiveness in proportion to population and assessed valuation, variety of climate and scenery, and commercial, industrial and recreational service rendered.

And one wonders how many Californians, on Thanksgiving Day, gave due thanks, whether in word or thought, for our good roads and all their connotations. Not that we should magnify, in our thanksgiving, the material things of life, but that we should realize how and to what extent the material is the expression of the spiritual, and in turn feeds and fosters the spiritual, and carries it on to greater heights.

In cultural standards, California has few peers and no superiors among the congregation of commonwealths which make up this great country of ours; and it is at least no exaggeration to say that our magnificent and extensive system of highways is one of the prime factors of our aesthetic exaltation—in large measure, both cause and effect of an exceptionally high standard of citizenship.

Can you think of any of the imponderable blessings or virtues or felicities to which good roads do not contribute largely—such as health, pleasure, beauty, education, sympathy, understanding—yes, and religion?

Over our thousands of miles of broad, smooth-surfaced highways you can almost literally float, at a high rate of speed, along

the seashore, through the valleys and over the mountain tops, enjoying an almost infinite variety of scenery and a wide range of climatic conditions, all in a few hours' time, at any season of the year. And beauty and majesty and power, in the hand-writing of God himself, are scattered lavishly all along the way. Your tired mind is rested, your taut nerves relaxed, your body exhilarated, your spirit exalted but reverent.

Considered merely in a material sense, Californians have reason to be thankful for their highways; for it is doubtful if our state has any greater source of material wealth. This statement, of course, is empirical, for there is no way in which exact computation can be made of the actual, much less the potential wealth produced, or induced, by our highways. But, however, empirical it may be, the statement that our highways, in the last analysis, are, perhaps, our greatest source of material wealth, will bear the most crucial statistical test to which it can intelligently and fairly be subjected. The good roads factor, in computing the present and potential wealth of California, is so big and all pervading, and mathematically progressive in such ever increasing ratio, as to be almost limitless. It staggers the imagination.

To have as our inheritance "Just California, stretching down the middle of the world," is enough to prolong our Thanksgiving Day throughout the whole year and all the years; but to have its beauty and beatitude spread before us as at a banquet table, by our fine system of highways, is enough to lift up our hearts in continuous songs of thanksgiving and praise to Him "from whom all blessings flow."



J. P. BAUMGARTNER.

The State Highway Construction Program

How the Biennial Program is Built Up, and How the Projects Included In It Are Determined

By C. H. PURCELL, State Highway Engineer.

A HIGHWAY construction program involving the expenditure of over \$50,000,000 in the two-year period from July, 1929, to July, 1931, will be submitted to the legislature when it meets in January.

There are few subjects in which the public is more vitally interested than in its highway program. Accordingly it will be of interest to know just how a highway construction program is built up, how the projects that go into it are determined, who participate in the deliberations that precede the final formation of the program, and where final approval vests.

Let it be said in the beginning that the formation of a state highway program is a long and involved process. This is true by reason of the fact that California is a large state with highways radiating all over it, and the importance to California of the orderly and intelligent development of its highway system requires thorough accumulation of engineering facts and a careful analysis of them. The basis of any proper program must be a knowledge of facts, determined by the most careful study. This study must be of twofold character.

First, it must show the importance of projects with reference to local needs.

Second, it must also show their importance with reference to state necessities and the ultimate development of the state road system.

The importance that the Division of Highways attaches to the importance of a complete and careful study of the highway situation, both in its local and state aspects may be seen in the fact that although the program for the biennium of 1929-1931 has just been completed, instructions are already out to district engineers to begin their study of projects to be recommended for approval in the program of the 1931-1933 biennium.

There are certain legal requirements that are fundamental in the preparation of a state highway program. The Breed bill determines on a percentage basis the allocation of money between the northern and southern groups of counties and between primary and secondary roads. The program must meet the percentage requirements of that enactment.

Of necessity the amount of money available for construction is also a determining factor. This requires a careful estimate of probable collections under the two gasoline tax laws and other revenue bills.

With these exceptions, problems connected with the formulation of a highway construction program are largely of an engineering nature. And it is with the engineers that the work begins.

Incidentally it should be noted that the work not only begins with the engineers, but it begins with the district engineers, the men in charge of the geographical districts into which the state is divided. We begin on the ground and work up.

Each district engineer upon the completion of the study of his own district submits a list of projects with estimates of each, based at least on preliminary surveys, which he

recommends for inclusion in the construction program for the coming biennium.

The recommendation of the district engineers must also indicate whether the project is best adapted for summer or winter construction, and if approved, the approximate date when it will be ready for advertisement. The right of way situation as it affects the individual projects must also be analyzed. This analysis must indicate any possibility of construction being hampered by right of way delays. New construction and reconstruction projects must be listed separately.

The recommendation of the district engi-



C. H. PURCELL.

neers must then run the gauntlet of the headquarters staff, the State Highway Engineer and the Director of the Department of Public Works. The latter bring to the problem knowledge not only of local needs but a broader view of state necessities than it is possible for district engineers to have. They have also before them information gleaned from road associations and local bodies and from conferences held with representatives of localities all over the state.

The work of whipping the recommendations of the district into a highway construction program now begins.

The projects recommended by district engineers must be pared to meet available funds with a proper reserve for safety.

The yardstick of the Breed bill must be applied.

The list of projects recommended by the district engineers are given careful study by the State Highway Engineer and his headquarters staff, and the list of projects revised to meet the funds available and the plan of ultimate development of the state road system, due consideration being given to the coordination of the construction and reconstruction programs with the maintenance of the state highways.

The district engineers are then invited to sit in conference on a review of the modified list of projects and further revisions are made until practical agreement is reached.

Each project, before being given a place in the program, must justify itself against other projects proposed as alternates and substitutes. There are adjustments and readjustments, changes and amendments, before the program is approved by the State Highway Engineer for submission to the Director of Public Works.

The program is then submitted by the State Highway Engineer to the Director of Public Works and a further conference follows attended by Director, State Highway Engineer and staff engineers and it is again thoroughly analyzed and such further changes are made as seem advisable.

But the program is not yet complete. The program goes from the Director of Public Works to the California Highway Commission, the members of which have very definite ideas as to plans for highway procedure. The Director of Public Works must justify his recommendations to that body. After their approval of the program as recommended or amended to meet the judgment of the members of the California Highway Commission, the program goes to the Department of Finance and the Governor for approval and

for recommendation by the Governor to the state legislature for adoption by that body.

The budgeting of highway funds is a new departure in highway procedure in California, a departure inaugurated by Governor Young. Let it be remembered that a budget is but another name for a program. The budget or program plan for state highway building has more than justified itself in California. Its virtues may be designated as follows:

1. It necessitates the most careful study of the highway problem both in its parts and as a whole in advance of any formulation of a highway building program.

2. It permits sectional interests to be fully heard in advance of decisions, but reduces sectional influence as a determining factor in making such decisions.

3. It correlates expenditures with income more closely than was possible when programs were largely determined upon a month to month plan.

4. It permits programs to be developed which avail themselves of seasonal advantages that different sections of the state offer for work, which not only reduces costs but aids in reducing unemployment during the winter season.

5. It permits the distribution of the work to proceed in an orderly and equitable manner, which in its turn will mean the earlier completion of the highway system.

6. It permits road planning over a long period of years, with a consequent large decrease in final road costs.

Adopts Gas Tax

A two-cent gasoline tax will go into effect in Massachusetts January 1. This leaves New York the only state in which a gasoline tax has never been adopted. Illinois adopted a two-cent tax in 1927 but the law as drawn in that state was held unconstitutional. This leaves the status of the gas tax as follows:

5 cents.....	Six states
4 cents.....	Twelve states
3½ cents.....	One state
3 cents.....	Fourteen states
2 cents.....	Thirteen states
No tax.....	Two states

Four provinces in Canada have a 5-cent gas tax, namely, British Columbia, Nova Scotia, Prince Edward Island and Quebec. Five provinces, Alberta, Manitoba, New Brunswick, Ontario and Saskatchewan, have a 3-cent gas tax.

The average rate in the states is now 3.11 cents and in the provinces 3.88 cents a gallon.

An exchange says: "The ideal situation will be attained when a car is in reach of every man, and every man out of reach of a car." But ideal conditions are hard to attain in this world.

How Highway Bridges Are Inspected

By F. W. PANHORST, Construction Engineer, Bridges, Northern Section.

OLD, OR EXISTING, bridges are inspected to insure safety for the traveling public; new bridges, or bridges under construction, are inspected to insure the incorporation of satisfactory materials and methods in the assembling of the new structure. All bridges on the state highway system of California are inspected—both existing bridges and bridges under construction—by engineers of the Bridge Department. Existing bridges are, in addition, under the continual inspection and maintenance of the Maintenance Department.



F. W. PANHORST.

Although these engineers are not heroes, they are nevertheless unsung. The object of this short article is not to attempt to give these engineers a place in the spotlight, but to attempt in a short and general way to give those who are interested an idea of how and why bridges on the state highway system are inspected. The traveling public places, unconsciously, implicit faith and confidence in the various engineers of the Highway Commission—not only those inspecting bridges. A car rushes at night down a smooth but strange road, seldom, if ever, does the driver stop to think that there might be an obstacle in his way—a deep chuck hole, a fallen tree, a large rock, or what not. When he comes to a bridge, even though he may be on an overladen truck, he rushes across with never a thought as to whether it is safe. They all take for granted that the road beyond the reach of the headlights' gleam is safe, although they may not be able to stop within that distance, and that the bridge which they do not see until they are upon it is sufficiently strong to safely carry them over. Fortunately, due to the watchfulness of the Maintenance and Bridge Departments, the driver's assumptions are usually correct.

FORTY-TWO MILES OF BRIDGES

There are, in general, two main divisions of bridge inspection, that for old or existing structures, and that for new bridges, or bridges under construction. The inspection of existing bridges is primarily to insure safety to the traveling public. There are, on the highway system, approximately 1600 bridges with a total length of 42 miles.

A complete exhaustive and minute inspection of all bridges on a state highway system has perhaps not been made in any state. This applies also to California. However, a "Bridge Survey Crew" is now making such a survey in this state. All of the bridges have been inspected in a general way for safety with regard to structural strength and handling of traffic. The bridges are then to be carefully and completely inspected and records and reports compiled. The reasons and necessities for this are numerous and important.

DETERMINING LOAD LIMIT

The load limit of each bridge can be determined. Frequently it is desired to move unusually heavy loads across a certain bridge, or bridges, in a certain locality. From the results of the inspection now under way it will be possible at a moment's notice to tell if the bridge, or bridges, in question will safely carry the load. This is of particular importance in transporting contractors' and state's heavy equipment from place to place on the highway. From this report it will also be possible to determine which bridges are not of sufficient strength to carry the normal traffic of the particular community and the kind and cost of repairs can be determined along with the probable remaining service life of the bridge. It will be possible to tell which bridges should be rebuilt first, in what order, and when, which will be especially useful in preparing budgets, both for the immediate and distant future.

TRAFFIC PROBLEMS

Of almost equal importance with the strength of the bridge is the traffic consideration, location and alignment. Although a bridge may be of sufficient strength to carry normal traffic, it may be too narrow to carry the traffic of that particular location, or the alignment of the highway adjacent to the bridge may be of such a dangerous nature

that it is advisable to construct a new bridge to overcome this danger. These are but a few of the uses to which the inspection report will be put and it is easy to visualize its great value.

One trip of the doctor does not always permanently cure the patient. Due to the effects of annual high water, rusting of metal, decay of wood, etc., periodic inspections are necessary. Such inspections cover not only the deck, or riding surface, but the entire structure, especially the foundations. Frequently, in times gone by, when a bridge, especially a timber bridge, was about to breathe its last, a new deck was laid and the railing painted. Traffic then crossed with a sense of security, feeling that a new bridge was theirs. Or a steel span may have rusted away 50 per cent of its strength to be repaired by the addition of a bright colored paint over the rust scales. Thorough bridge inspection is intended to prevent such and to insure safe and sane repairs when required.

DECEPTIVE APPEARANCES

To the casual observer a bridge may appear to be in a precarious condition structurally, whereas, in fact, it may be excessively strong and safe. For example, the piling on a bridge may appear in a weakened and dangerous condition on account of apparent decay, whereas only the sapwood for an inch or more has decayed and a good, firm and safe heartwood remains. Again a steel span may have rusted, as they have a great habit of doing, and thick rust scales make the bridge appear that most of the metal has rusted away. A very thin layer of steel will make a very thick rust scale and all that the steel may require is sand blasting and painting, with a resultant negligible loss of strength. But bridges which appear dangerous are not always safe.

A quick and careless inspection may show a bridge to be in a satisfactory condition, whereas, in truth, the opposite condition exists. Such an inspection is worse than none. For example—a timber truss may appear in the best of condition, well set off by a fresh coat of paint. The surface of the timber may appear, feel and sound firm, well preserved throughout its life. This is one case where you may save the surface but not save all.

The interior of the timber, such as the chord of a heavy timber truss, may be nothing but dry rot, the original heavy timber now being but a shell and deceiving in appearance. The condition of the interior of a large timber or pile is examined by means of an increment borer, a hollow wood drill by means of which a core about one-fourth inch in diameter may be secured. This drill furnishes a sample core of the timber similar to a diamond drill core from rock.

Many other conditions of a bridge may be different from what they appear to be from casual inspection. As for example, piling in a trestle may appear sound and in good condition, whereas, at the ground line, they may be rotted through. A pier may appear in good condition down to the water line while the base may be undermined. These are but a few of the many conditions which an inspector must investigate if the inspection is to be of value, and for these reasons it is essential that the inspector be an engineer of

experience that he may know what to look for and what to do with it when he finds it.

INSPECTING MATERIAL

Inspection of materials and workmanship that enters into the construction of a new bridge is of equal importance

When you approach a bridge along the state highways, you feel no necessity of slackening, nor do you have any thought of danger.

This article tells the story of how the bridges along California's highways are constantly tested and continually inspected.

This is no small job as there are approximately 1600 bridges with a total length of 42 miles along the highway system.

with that of inspection of existing structures. As no chain is stronger than its weakest link, so no bridge is stronger than its weakest detail or member. Bridges are designed to carry a certain predetermined maximum load, the weight of which is determined by the kind of traffic that is to cross the bridge. This load having been decided upon, all parts of the bridge are designed to be of relative strength, otherwise there would result an uneconomical design. The duties of the field inspectors are to see that proper materials are incorporated in the structure so that the bridge as built is the same as the bridge designed.

All materials and workmanship that enter into the construction of a new bridge are inspected and tested. Some of this work is done at the bridge site and some must of necessity be done at the point of manufacture. For example, take the structural steel that is to form a truss over some remote mountain stream. Before fabrication the steel is

Highway Commission Asks Abatement Of Signboard Menace Along Roads

The following resolution was passed by the California Highway Commission at its November meeting in Sacramento:

WHEREAS, Advertising signs and billboards in proximity to the public highways destroy the scenic value and, in many places, particularly on curves, menace the safety of such thoroughfares, and

WHEREAS, The California Highway Commission has by constant vigilance prevented the placing of advertising signs and billboards within the right of way limits of the state highways, but no law has yet been enacted in California which effectively suppresses the erection of advertising signs and billboards on private property outside the boundary of and adjacent to the public highways, and

WHEREAS, The Commission is of the opinion that outdoor advertisers are proceeding under a misconception of the economic benefits to them of a system which is rapidly defacing the famed landscapes of California and seriously detracting from the enjoyment of its citizens and its tourists,

Be It Resolved, That the Commission, on behalf of the Department of Public Works of the State of California earnestly urge all concerns, such as oil, automobile and tire companies, banks, hotels, cafes and business enterprises of all kinds, to remove their signs from private property bordering on the public highways, and cooperate with the public authorities to the end that the natural beauty of California may be preserved and the public highways may be the mediums through which such beauty may be observed, and

Be It Further Resolved, That civic organizations throughout the state be encouraged to join in a campaign to induce outdoor advertisers in their respective communities to discontinue the present practices which are becoming so increasingly objectionable to the public at large.

Development Association Would Save Beauty of Scenic Highways

At a joint meeting of the Statewide Highway Committee and five regional highway committees of the California Development Association held in San Francisco on October 18th, the following resolution was adopted:

"It is recommended that the board of directors of the association request all Regional Advisory Councils to consider, through their highways committees, the state and county highways in their region to be designated as scenic boulevards, and that this consideration be given with dispatch, so that the Statewide Highway Committee of the association may be in a position to consider legislation or other means designed to prevent the devastation of our scenic highways by unsightly vending stands and poorly-placed signboards."

The published minutes of the association give the following account of the discussion:

Mr. Edward Landels, attorney, of Oakland, spoke at the request of the chairman. He explained the

law governing county planning commissions and discussed the subject in its relation to the efforts of the highway committees to control poorly-placed billboards and vending stands on scenic highways and the securing of additional right of ways for highways. Mr. Landels stated that courts as yet had failed to uphold most laws aiming to regulate signboards and vending stands along right of ways, but expressed the belief that there will be a change and that the courts would tend to follow public opinion when it became strong enough on this subject. He stated that the only effective remedy at present seemed to be the adoption of a constitutional amendment, authorizing the state to pass legislation to regulate the objectionable features. This itself, Mr. Landels stated, may be of doubtful constitutionality. Planning commissions can be of direct usefulness in protecting and providing right of ways for highways because they can zone the county in accordance with an established plan.

SCENIC HIGHWAYS

Mr. Wishon explained that the Regional Highway Committees had taken up the matter of protecting

Majestic Oak Is Signally Honored



The Hutchins oak.

The interest of the California Highway Commission in the preservation of outstanding features of unusual charm and public interest was evidenced by the passage of the following resolution at its November meeting:

WHEREAS, The members of the California State Highway Commission are very much interested in the preservation of the natural beauties of the state, and

WHEREAS, There is on the Thomas A. Hutchins farm in the Central House District immediately east of the Feather River on the Oroville-Gridley county road, in Butte County, one of the largest oak trees in the state, known as the "Hutchins Oak," which tree is a fine example of the productivity of the soil and climate of Butte County, now therefore be it

Resolved, That this Commission takes the liberty of suggesting to the honorable board of supervisors of Butte County that they take the necessary steps to acquire ownership of said oak tree and sufficient land about it, in order that the tree may receive the proper "surgical" aid and care and be preserved as long as possible as one of the marvelous products of Butte County.

This tree, locally known as the "Hutchins Oak," is one of a triumvirate of three world-famous trees in Butte County. The others are the Hooker Oak, near Chico, and the Mother Orange tree, at Bidwell Bar, near Oroville. The latter two trees are already publicly owned.

The Hutchins Oak is 129 feet high, and still is growing.

scenic highways of the state from the inroads of poorly-placed signboards and disreputable looking vending stands, and asked Mr. Willett to present the above recommendation sponsored by the Central Coast Committees.

Mr. Meyer of the North Coast Council expressed opposition to the idea of limiting the activity to certain designated "scenic highways" and urged that all highways in the region be protected in the same way from billboards and unsightly erections.

Mr. Roth of the Central Coast stressed the importance of designating the highways to be worked on in order to limit the job to a reasonable task.

Mr. Shaffer of the San Joaquin Council voiced objection to certain signboards placed at the entrances to cities such as Modesto, on the grounds that such signboards caused economic damage to communities.

Mr. McNeill of southern California, manager of Foster & Kleiser, stated that his company had a definite and broad policy of cooperating with every reasonable effort to protect scenic spots and highways, but he felt that outdoor advertising was a legitimate and established business and that locations for signs

FEED HIGHWAY "CONS" POTATOES FROM HOME IS PLEA TO STATE

Here is a letter that came to the state purchasing agent a short time ago, the writer being a California business man:

"Dear Sir:

"When in need of potatoes to feed your convict gang working on ——— road, we would like very much to make a bid. At this season of the year we get our potatoes from Oregon and Washington in carloads and will quote very low price. And besides, a lot of these Cons are from Washington or Oregon and they prefer Washington or Oregon potatoes, and I am sure you want to please them."

at the entrance of cities and commercial areas was no more of an economic damage to a city than any other business structure, such as the buildings.

Improved Highways Aid Development at Lake Tahoe

By F. W. HASSELWOOD, District Engineer.

THE INCREASING popularity of Lake Tahoe is manifested by the intensive development in progress in the area surrounding the lake, by the unprecedented patronage of the resorts and by the volume of traffic on the highways. And coincident with this increasing popularity and development, and one of the contributing causes thereof, is the improvement of the traffic service on the roads leading to and around the lake.

The State of California, through the Division of Highways, is engaged in the business of furnishing a traffic service to its citizens. The erroneous idea sometimes prevails that its chief function is to construct and maintain roads, but while the actual activity of the division is evidenced by the mileage of roads constructed or reconstructed, or the quality of the maintenance, these construction and maintenance activities are merely the means by which the division presents to the citizens of the state its finished product, namely, the highest quality of traffic service that the finances and the skill of its organization can produce.

The Lake Tahoe region is fortunate in being well served with state highways. Two main highways reach the lake from the Sacramento Valley, one the state's first venture in roads, the "Lake Tahoe Wagon Road" via Placerville and the summer home area along the American River, and one via Auburn and Truckee. From the Nevada line near Brockway around the north, west and south of the lake are 53 miles of highway serving all of the area adjoining the lake in California.

Although the lake has been accessible by road since the early fifties, it is only in recent years that strict attention has been given to the improvement of the service rendered by these roads. Not until 1913, after the roads in the lake area had become state roads, was it possible to drive through on the west side of the lake. This was made possible by the construction of a road from McKinneys to Meyers, traversing the difficult and scenic country at the head of Emerald Bay. Continually as traffic developed the Placerville

and Auburn roads and the roads around the lake have been improved. The greatest impetus has been in the last few years, and coincidentally the greatest traffic increases have been recorded in that time.

Improvement in traffic service has been accomplished by two methods, construction or reconstruction of units of these roads and more intensive maintenance work on the unconstructed portions.

Two units of highway have recently been completed near the lake. Between Tahoe City and the state line at Brockway, a distance of 12 miles, the oil mixed rock surface was completed in the spring of 1927. During 1927, the road between Tahoe City and Meeks Bay, 11.3 miles, was graded and rock surfaced, and early in the summer of 1928 the rock surface was oil treated by the mixing method. During 1925, 1926 and 1927 grading was in progress on 10 miles between Meeks Bay and Emerald Bay. This year a contract was let for grading 3 miles, which will complete this unit.

Another unit of construction of great importance to the Lake Tahoe area is the 14 miles along the Truckee River between Tahoe City and Truckee. This road has been under construction for 3 years. The grading and rock surfacing have been completed, and early next season will see the completion of a bridge across the Truckee River and the Southern Pacific Railroad, and a subway under the Southern Pacific Railroad at Donner Creek near Truckee, and the oil treatment of the rock surface.

In 1927 both the Placerville and the Auburn roads were treated with oil, and made dustless. This treatment was repeated in 1928, and extended along the west side of the lake to provide a dustless trip from Sacramento by one route and return by another.

The effect of these improvements on the volume of traffic is measured by the census as shown in the following table for corresponding days in the respective years. The census was taken at Tahoe City, and shows the number of vehicles in 16 hours on the road south toward Meyers, the road east

At Majestic Lake Tahoe



Views on Lake Tahoe road. *Upper*, Emerald Bay; *middle* views, road scenes on the way to Lake Tahoe; *lower*, along the edge of the lake.

toward Brockway, and the road north toward Truckee.

	1924	1925	1926	1927	1928	Increase over 1924
South -----	436	715	1,685	1,703	3,213	736%
East -----	352	526	651	1,474	3,401	967%
North -----	162	280	800	803	2,452	1,530%

The development of the lake area is evident in many ways. Lake front property is changing hands at fabulous prices. Following the oiling of the rock surface between Tahoe City and Brockway, much activity in new subdivisions or disposal of older inactive tracts developed. This year in the subdivided area between Tahoe Vista and Brockway, 5 miles of paved streets are being constructed. This season the area traversed by the road between Tahoe City and Meeks Bay is the scene of much activity. Many expensive private residences are being constructed. Resort owners are expanding their facilities, and greatly improving the quality of accommodations offered. They state that this year they have to turn away many visitors, and that their business has been from 50 to 100 per cent better than ever before.

A notable change on the lake itself is the advent of the gasoline launch and the speed boat. The lake is no longer quiet, but resounds to the put-put of these boats, which are rapidly increasing in numbers.

The roads around the lake are recreational. They are closed by snow for from 5 to 6 months during the year. The principal traffic occurs during the three

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Making The Highways of California Safe

The following address was given by B. B. MEEK, Director of Public Works, over Station KPO, San Francisco, Monday, December 3.

MAKING HIGHWAYS SAFE is a controlling factor in modern road construction, and to this end millions of dollars are being expended annually in California and in other states where this all-important feature is recognized.

It is rather amazing that streets and roads laid out and built for horse-drawn vehicles have been so comparatively easy to remodel to take care of modern traffic requirements. The remodeling has consisted largely of flattening curves, vertical as well as horizontal, super elevating of curves to compensate for the curvature, widening grades, maintaining smooth and dustless surfaces, painting stripes on pavement to define traffic lanes, eliminating railroad grade crossings by realignment or by constructing grade separation structures and installing signs and signals warning the motorist that he is approaching a dangerous curve, steep grade, railroad crossing, slippery pavement or school; and the installation of arterial stop signs and signals against cross traffic.

WIDTH OF PAVEMENT

We are continuously raising our standards in California on our state highway system. Our minimum width of pavement has been fixed at 20 feet, giving us two 10-foot lanes. Our minimum width of grade has been fixed at 36 feet, which provides for an 8-foot shoulder on either side of the 20-foot pavement, thus giving the motorist ample room to stop his car with all four wheels off the pavement.

ELIMINATING DANGEROUS CURVES

Our maximum grade for steepness is 6 per cent. We are, as rapidly as finances will permit, eliminating dangerous curves all over the state highway system. Our experience has been that if a particular road has a high standard of alignment, with the exception of one short stretch, that one short stretch is a menace to the safety of the motorist and will cause numerous accidents. Therefore, we are striving to bring all roads to the same degree of alignment so that all sections of the particular road will be equally safe.

OVERCOMING DUST

Realizing the hazardous as well as annoying features of dust conditions on our natural soil

and gravel roads, we have, during the past two years, made some 1500 miles of these roads dustless by the application of light oils. During the coming year we expect to increase this mileage very appreciably, particularly so that the public may fully enjoy the recreational roads.

WHAT THE STRIPES DO

We have demonstrated that defining traffic lanes by white or colored stripes is not only a safety measure but actually increases the capacity of the highway. Because of our experience last year we are very greatly increasing our investment this year in this new safety device. Our coming biennial budget will provide for the striping of 1400 miles of our highway system.

While the zoning of pavements is admittedly an aid in the control and regulation of traffic, much of its benefit can be lost through the careless disregard of its tenets by slow-moving traffic usurping the inner or fast lanes. Again on multiple-zone pavements traffic peaks in either direction may require and should have the right to use all lanes not required by the opposing traffic. These, however, are points involving regulation which will surely follow a better understanding of the traffic-flow problem.

WARNING SIGNS

Warning signs are placed at all railroad grade crossings and curves where the vision is impaired or change in direction abrupt. The signals in vogue at these crossings include their illumination, the alternate heavy diagonal white paint stripe and the words "Railroad Crossing" spaced on the pavement at 50-foot intervals for 300 feet on each side of the crossing, the electric- or gas-operated flashing signal, and the particularly effective large illuminated sign suspended either side of the crossing, some 14 feet above the pavement, bearing the notation "RXR." In addition to these, many wigwag signals have been installed by the railroad companies upon our representation.

At curves the standard warning consists of either a 6-inch or 8-inch diameter red bullseye or a battery of nine of 3-inch diameter, both types of which are readily visible some 600 feet distant. These signs are undoubtedly an aid to the careful driver, and to insure their

(Continued on page 29.)

Reducing Accidents on State Highways

IN ORDER to get authoritative information from the various states as to what they are doing to prevent highway accidents, a letter was sent by the Florida Highway Commission to each state highway department with the request that they write a letter summarizing the work they are doing in this regard. Thirty-one states replied, each denoting interest in this great problem, and with the exception of one or two states plans for accident prevention were described in detail. The presentation of this data will be more or less a summary of what these 31 states have indicated they are doing toward the prevention of highway accidents.

This report is divided as follows: Engineering, dealing with all the physical features of the highways, including construction and maintenance; legislation, pertaining to the laws controlling the construction and use of the highways; operation, dealing with the use of the highways; education, dealing with the user of the highways, and enforcement, with operation and use of the highways.

ENGINEERING

There is a striking similarity in the programs of all states. Practically all engineers and commissioners recognize that the construction of highways in such a way that they may be devoid of any hazard is an essential to highway safety.

SIGNS AND MARKINGS

It is almost universally accepted that the proper signs and markings are now essential for highway safety.

Traffic stripe on curves is very generally practiced. In some states the center stripe is used the entire distance of the highways, especially on heavy traffic roads. In at least one state a special color stripe is used on all curves or grades that are especially dangerous. This special color, probably yellow, also indicates that cars can not pass at these particular locations.

Practically every state is installing guide and precautionary signs for the benefit of the highway user, if they have not already done so. In most instances the signs are those recommended by the American Association of State Highway Officials. Several of the states at the present time are practicing the installation of a white cross wherever there has been

a fatal accident. This has been practiced for many years by a few of the states, but now it seems to be more or less a universal practice.

Traffic is required to stop before entering the trunk highways in some states, and in the case of trunk highways intersecting, semaphores or "stop and go" lights have been installed for the purpose of taking care of the traffic. In one state intersections of state highways are constructed with curves of 500-foot radius and no obstructions are allowed on the inside of the curve.

GRADE CROSSINGS

The elimination of grade crossings is one of the great features contributing to highway safety, and all states have programs for this work in proportion to funds available. Where there are not sufficient funds to eliminate grade crossings, warning devices are erected to call the danger of the crossing to the attention of traffic.

VISIBILITY

Visibility is commanding considerable attention. It was referred to by many of the states. Minimum visibility is not less than 300 feet, and many of the states are attempting to get a visibility of 500 feet. Some states are attempting to get visibility of 500 feet on vertical curves and 350 feet on horizontal curves. Most of the states are cutting brush and removing other obstacles on highways or right of way that in any way impair the visibility of the drivers of vehicles.

GUARD RAIL

Guard rail is another important detail of construction that can be considered under engineering. In some states this item is regulated in proportion to the funds available for road work, but as nearly as possible guard rail is constructed on all fills over 4 feet in height and at dangerous curves, or other places which should require special treatment for the safety of the driver.

EMBANKMENTS

Several of the states are constructing embankments with 4:1 slope so that vehicles in time of necessity can run down the slope without turning over.

One state refers to the construction of wide ditches with flat slopes. These are termed

California Contribution to Highway Building Lauded by U. S. Engineer

By DR. L. I. HEWES, Deputy Chief Engineer, United States Bureau of Public Roads.*

THE ENGINEERS of the Division of Highways in the California Department of Public Works, during the fall of 1926 and the summer of 1927 have achieved results for dustless, smooth roads which are remarkable. Starting with old principles they have developed a method of incorporating light asphaltic oil with fine crushed stone and gravel surfaces that is an improvement on any past methods.



DR. L. I. HEWES.

A similar method was used by the Wisconsin State Highway Commission in 1923, but it was not developed as the California engineers have now developed it. In brief, the method is characterized by the blading back and forth over the surface of material

about two and one-half inches in depth to which a light asphaltic oil has been added. The scientific study given this work and the perfection to which the process has been advanced is an achievement for the California engineers.

REMEDY FOR DUST NUISANCE

It has completely eliminated the dust nuisance and produced a surface which bids fair to be enduring and of cheap maintenance, and it has compelled the attention of road builders throughout the west. Assistant State Highway Engineer Stanton presented an outstanding paper on this subject at the Denver meeting of the American Association of State Highway Officials. The matter has also been carefully presented in "Public Roads" for September, by McKesson and Frickstad.*

This type of surface has been variously designated, but the term "oil-mixed top" is becoming current. The road is remarkably smooth. Some sections have shown a roughometer reading of about ten inches per mile, which compares with the best higher type sur-

faces. The wearing surface resulting from the oil-mix process is from two to three inches of dense material quite similar to asphaltic concrete.

For success the oil-mixed process, like other surfaces, requires a firm base. It is not a method of road building, but a method of producing a wearing top, dustless and smooth. Where the fine-crushed surfaces have been successful the oil-processed top is successful.

BEST RESULTS

The best results are obtained where the material of the top is not of greater maximum sizes than three-fourths inch and where the grading of the material in the top is sufficiently complete through the smaller sizes. For success with the oil-processed top it is not necessary that the top two inches of the road be tight or solid, but the base must be hard.

In fact the oil-processed top was developed in the Imperial Valley because the ordinary surface penetration method would not work on account of the looseness of the top of the roads in this dry area.

There are a great many miles of fine metaled roads that still have sufficient depth of material to permit oil processing with economy and success. If the roads are wash-boarded or rough they are first given a preliminary treatment to make them smooth and uniform. Afterward they are uniformly scarified or broken up to a depth of two or three inches.

It is at once apparent that a road on which only from two to four inches of metal remains is not a good road for success with this method. There must be a hard layer under the processed top for success, but there should be no layer of untreated material between the base and a processed layer when complete. Roads that show a tendency to break through or with soft subgrades will not be successful.

ROAD "LOSSES" IN WEST

In the western states there are several thousand miles of fine crushed roads on which the annual loss of material varies from a negligible amount in the moister areas, particularly in the forests, to an extraordinary amount in the open arid areas with high winds, possibly

*This article first appeared in *The National Motorist*.

one and one-half inches per year where the travel exceeds four hundred vehicles.

INDIANA GRAVEL ROADS

Research in Indiana indicates a loss on gravel roads for three consecutive years averaging about 290 cubic yards per mile per year. With a loss from one-half inch to one inch per mile per year, or from 130 to 260 cubic yards per mile per year, the money loss at \$3 per cubic yard is from \$390 to \$780. The oil-processed top has completely stopped such losses.

METHODS EMPLOYED

As stated above, the road is scarified and then light asphaltic oil (usually fuel oil known as 60 to 70 per cent asphalt) is applied by mechanical distributor. The oil need not be hotter than 200 degrees F. It is applied at a rate not exceeding one-half gallon to the square yard per application.

Right behind the spreading truck follows a train of disc harrows, and sometimes also a spring tooth harrow. The harrows partially mix the loosened top with the oil. Usually there are two or three half-gallon applications with separate harrowing for each. Also usually one-half the road is worked first, with travel turned on the other half.

After the harrowing, a blade machine drawn by a tractor or other adequate power begins manipulation for the final mixing of oil and crushed material. On the first trip the big blade usually moves the full depth of the top toward the center for half the road width. It is essential that the blade cut through to the hard surface beneath the partially mixed oil and fine material, but it is equally important that the blade move only the loosened material and not scrape any new material from the bottom.

The amount of blading to get all material to a windrow in the center will depend upon the power and size of blade, width of road, etc., but when it is done travel can operate on the bared lower surface and the other half of the road may then be treated with oil. In fact usually treatment of the other half of the road has already begun because by this oil-mixing method there is no harm to the travel by spattering oil. The oil on the loosened surface simply does not spatter and the wheels of vehicles can not harm the processing.

After both sides have been bladed to the center, the blades then separate the windrow and move the material back to the edges and repeat the process until all is of a uniformly brown color. The road is then carefully

UNITED STATES DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE

Crater Lake National Park
Medford, Oregon

Office of the Superintendent

October 16, 1928.

Mr. C. H. Purcell,
State Highway Engineer,
Sacramento, California.

Dear Mr. Purcell:

Mr. T. R. Goodwin of your organization, whom we borrowed from you in June, left today to return to Sacramento and I want to thank you for loaning us his services.

Mr. Goodwin brought us out of dusk into daylight on this "California Mix" work and as a result of his efforts we have nearly 18 miles of splendid dustless highway including the unpaved portion of the Medford and Klamath Roads and the main stem from Anna Spring to the Lodge. The results of his work have sold us on this type of finish and we expect to continue it indefinitely.

Mr. Goodwin has been really splendid; in addition to his value to us technically he has contributed a fine spirit and an enthusiasm that has been a great help in sustaining the morale of our outfit. Everyone at the park not only respected but liked him and a letter from the Yellowstone—to which park we let him go for about three weeks to help them similarly—reveals that he made good in the same way there.

We are much indebted to you for his services, indeed.

Cordially yours,

C. G. THOMSON,
Superintendent.

smoothed to a true crown by skilled operators, and traffic does the rest.

SUCCESS NOW ASSURED

This all seems a simple process, but there has been constant development since it began in the fall of 1926. The amount of oil has been controlled, the amount of mixing has been ascertained, the measurements of both are known from the color, and a "stain test" has been used with success to gauge both the oil and the mixing.

The road surface developed seems to be about two to two and one-half inches in thickness and it is tight and homogeneous and the road does not corrugate and seldom ruts. It is as smooth as good pavement. There are excellent examples of this work on the road from Briceburg to El Portal, from Victorville to Barstow, and from Emigrant Gap east to the Nevada state line.

The entire cost of oil and mixing is from \$1,000 to \$1,300 per mile for an 18-foot road.

(Continued on page 27.)

The Sand Hills Road

By E. Q. SULLIVAN, District Engineer.

AFTER TWO YEARS of use, the highway across the great sand dunes near Yuma is a proven success. The road has now been through four windy seasons, the spring and fall of each year, and no trouble has been experienced. The road has always been clear of drifting sand and the sand fills supporting the pavement have not been disturbed by wind action.



Multitudes of small sand dunes approaching the highway.

A single track plank road was built across the dunes in 1916, and for many years was considered the only possible type because of the shifting sand. It was kept open for use by digging out the planks after each storm and then raising or lowering them to fit the new sand dunes that move along with each wind.

Five years ago intensive engineering study was undertaken to solve the problem of constructing a more satisfactory highway across these shifting sand dunes. After a great deal

better road surface that could be raised and lowered in a manner similar to the old plank road. All these plans were also finally rejected.

The final plan adopted was that of constructing a standard pavement on high sand fills, higher than fast moving sand dunes. It was found that only the small sand dunes move fast. Those over 30 feet high move very slowly. The movement of the dunes that are 200 to 300 hundred feet high is scarcely perceptible. The new road was built up on sand fills to be level with the top of dunes as high as 30 feet. In order to keep the high sand fills of the new road from blowing away, these fills were oiled. The road was located to avoid the very high slow moving dunes.

Previous to the construction of the new road, the old plank road was kept open to traffic only with the greatest difficulty during wind storms. In spite of the heroic efforts of



The old and the new. The old plank road can be seen on the left, paralleling the highway.

the maintenance men, it was often closed for hours at a time during a stormy day and during the darkness of a stormy night the men many times had to give up in despair.

The smaller sand dunes now march up to the highway and blow over above the pavement in great white sand streamers. The oiling of the high sand fills of the new road has proven a complete success and the wind has never disturbed them. There has not been a moment of interruption to traffic for the past two years.

Burning and clearing operations on state highways planned to aid in the prevention of fires have been greatly extended this year. A total of 661 miles of highway right of way has been burned under the direction of state highway maintenance forces. The cost to the state for the season has been \$37,851, or an average of about \$57 per mile.



Great sand dunes marching toward the highway.

of study and the consideration of innumerable plans, it was finally concluded that a successful road could be built. Elaborate experiments were carried out in attempting to control the shifting sand dunes, but thought of their control was finally rejected. Other plans considered were those of constructing a

The Crest Drive

Rapid progress is being made by the contractors in constructing the new road into the San Bernardino Mountains. There are two contracts under way and the road is beginning to appear along the face of the mountains. It can be seen from all of San Bernardino Valley and the blasting operations of the contractors can be heard in the city of San Bernardino. The contractors are working night and day and the lights of the power shovels twinkle on the side of the mountain at night.



Upper right, one stretch of highway is now open to travel; Center, winding road; Lower left, the present narrow steep is congested with traffic.

This road leads into the Big Bear Lake region and connects with the Lake Arrowhead resorts. The existing road has grades as high as 20 per cent. It is narrow and the countless short turns are the terror of motorists. The new road will be truly a high-gear road and the accompanying pictures of the parts of the road already completed illustrate the sweeping curves that will replace the sharp turns.

The present work is a cooperative project between the federal government and the State of California. The $4\frac{1}{2}$ miles of road now completed near Running Springs Park was a state day labor job.

Highway Through Heavy Redwood Timber in Humboldt County Completed

By M. H. HUBBS, Resident Engineer.

THE completion of the Hauser and Englehart contracts, from Orick, Humboldt County, to the Del Norte County line, eliminates 15 miles of rough, winding road through dense Redwood forests and cuts one hour from the driving time between Eureka and Crescent City.

A 24-foot crown width road, increased to 30-foot crown width in the low country, surfaced with crushed gravel 20 feet wide, was constructed at a cost, including the heavy clearing, of approximately \$600,000.

The Englehart Paving and Construction Company was awarded the contract for clearing and grubbing the 15-mile project, consisting of 65 acres of trees, stumps and down logs which were larger than 12 inches in diameter.

All trees, stumps and logs under 12 inches in diameter were included in the grading contracts, which were awarded to W. H. Hauser, Oakland, California, from Orick to Russ

Grove, 8.5 miles and the Englehart Paving and Construction Company, Eureka, California, from Russ Grove to the Del Norte County line, 6.5 miles.

HEAVY CLEARING

Practically all of the project lay in dense redwood forests almost impenetrable, with immense down logs, heavy underbrush and redwood trees up to 14 feet in diameter.

The falling of these large trees, the blasting of the stumps and their removal from the construction limits was a problem made more difficult by the litter of down logs, some of which had lain for hundreds of years partly buried, while trees 6 feet in diameter had grown on top of them.

The falling was done by 16 choppers working in sets of two to each tree. The choppers were followed by the buckers, or sawyers with drag saws, who cut the logs into merchantable lengths suitable for handling. The buckers were followed by the powdermen who blasted the stumps. The logs and stumps were then removed by the blocking crew.

Six months were required by four crews of blockers, 10 men per crew, to complete the removal of 1900 trees from 65 acres.



1. The old road. 2. Clearing the way for the new highway. 3. Mammoth stumps that were removed. 4. The new highway.

Each crew was made up as follows:

Blocking:

- 1 9x11 spool donkey (steam).
- 1 Donkey operator.
- 1 Spool tender.
- 2 Riggers.
- 4 Hook tenders.
- 1 Wood buck.
- 1 Water buck.

Falling:

- 16 choppers.
- Bucking up.
- 4 Sawyers.
- 2 Drag saws.

Stumping:

- 1 Powder man.
- 7 Helpers.

Clearing cost, including material and equipment:

Falling	\$9,250 00
Bucking up.....	5,658 00
Stumping	18,974 00
Blocking	50,122 00

Total cost..... \$84,004 00

The average total cost per acre was \$1,292.37.

The average cost per tree was \$45.15, or \$7.11 per thousand board feet of standing timber.

The number of trees separated into sizes and their average approximate cost per tree is as follows:

	Average cost per tree
486 trees 12" to 20" diameter.....	\$16 65
416 trees 21" to 30" diameter.....	26 35
288 trees 31" to 40" diameter.....	38 10
328 trees 41" to 60" diameter.....	52 85
124 trees 61" to 80" diameter.....	74 30
118 trees 81" to 100" diameter.....	93 70
101 trees 101" to 220" diameter.....	171 65

Forty tons of powder were used in blasting the stumps at an average cost of \$6.45 per stump, or an average of 15 cents per inch diameter of tree.

Many of these stumps were from 10 to 20 feet in diameter at the ground.

GRADING

The material on the northern half of this project, (The Englehart Contract) contained clay, which, due to continuous fogs, never completely dried out, and the contractor was confronted with the problem of hauling the material away from his shovels over practically impassable roads.

Five-yard dump trucks were quickly discarded as too heavy. Ford $1\frac{1}{2}$ -yard trucks were used with some success, but they quickly cut ruts requiring continuous maintenance in order to haul at all.

Fordson $1\frac{1}{2}$ -yard iron mules were then used and proved very successful. The wide wheels ironed out the spongy subgrade and little maintenance work was necessary. Four of these iron mules were sufficient to keep one shovel going, hauling from 300 to 1000 feet and handling from 300 to 350 cubic yards per shift.

SURFACING

Rain falls in this part of Humboldt County 11 months out of 12, making the construction of a suitable subgrade a difficult and expensive problem. Heavy fogs kept the subgrade in a wet condition between showers. In some cases suitable material for decking was obtained for placing on the worst places but this

decking material was scarce, and as a rule it was a matter of fighting the mud. Surfacing operations were suspended for five months during the winter.

Underground water was encountered on the northern portion and the subgrade at these places was drained by tile drain placed at the side of the road, parallel to center line and 3 feet below the subgrade. About 4000 feet of 6-inch tile drain was placed.

TRAFFIC CONDITIONS

One of the most important problems involved was that of "carrying traffic through construction without interruption."

While traffic is much heavier on many other highways throughout the state, few, if any, suffered the congestion which occurred on this 15-mile stretch of one-way road, with widely separated turnouts and frequently blocked by construction operations. Four hundred to five hundred machines was the daily average during the months of June, July and August, requiring a force of seven traffic officers.

These men were appointed by the Motor Vehicle Department but worked under the supervision of the resident engineer.

Two strings of cars, each in charge of two traffic officers, left each end of the job simultaneously, passing at a designated point about half way. Two officers acted as flagmen at each end and the seventh patrolled the road directing and giving assistance to such stragglers as had dropped out of the line on account of tire or motor trouble.

Dust at times became bothersome to the drivers in the long strings of machines and it became necessary to sprinkle the road, which required two water wagons 8 hours per day each. Long lines of machines cut the road up badly, which made frequent blading necessary.

The cost of handling traffic, including this maintenance work, was \$13,200 or about $3\frac{1}{2}$ cents per cubic yard of excavation, and about 10 cents for each car conducted through the work during the existence of the control system.

A MILE OF CONCRETE

The editor of *Michigan Roads and Pavements* is authority for the following figures:

A mile of concrete 18 feet wide and 7 inches thick is equivalent to 2000 cubic yards of mixed concrete. It covers $2\frac{1}{2}$ acres of ground.

Contains 3400 barrels of cement which is 17 car loads.

1100 cubic yards of sand or 32 car loads.

1600 cubic yards of crushed stone—46 car loads.

300,000 gallons of water—38 tank car loads.

The total weight of the mile of concrete is approximately 4000 tons.

To burn the cement required for a mile of road it requires 340 tons of coal and to sack it 13,600 sacks are required. To make these sacks 13 bales of cotton are used.

When we add to this the engineering and construction costs, it is not difficult to understand that it takes money to build real roads.—*Nation's Highways*.

War Department announces that a man, no matter how far he may fall through space, can not fall faster than 118 miles an hour. Well, not being much of a speed fiend that would be plenty fast enough for us, but it seems as though something should be done about it for the benefit of those who like to travel fast.—*Albany Knickerbocker Press*.

State Crew Praised for Fire Fight

1 1 1 1 1 1

OFFICIAL REPORT of G. H. Cheeseman, maintenance foreman, in regards to the work done by the maintenance crew during the recent fire from Guatay to Buckman Springs:

The fire started Friday p.m. at about 1.30 near Sta. 781+00, Sec. D. As we were hauling granite from the Hoor Pit, it was nearly 2.30 p.m. by the time we arrived at the fire. Two men were dispatched at once, one to keep ahead of the fire and another to follow up to warn the traffic and to also stop the traffic when it was unsafe to go through on account of smoke or flames. The balance of the crew followed up, putting out fires that were burning telephone poles and trees. As the foresters were handicapped for men they were not putting the tree fires out, but trying to check the brush fire. The maintenance crew worked until 8 p.m., Friday, August 31. As everything looked O. K. we came in for the night.

We went out again at 4.30 a.m. Saturday, September 1. The forest service had got some men during the night, and the district ranger wanted some of my men for crew leaders. I released four of our men and he gave me men in exchange.

The fire burned so fast Saturday, the 1st, that we could not keep up with our putting the fires out in the various trees. I had to have one truck go ahead with the danger signs—putting them wherever there was danger of trees or limbs falling across the traveled way.

Five of us stayed out until 8.30 Sunday morning when we came in for two hours sleep and some eats. We were back in the fire line at 11 a.m. and stayed until 10 p.m. Sunday. We were pretty well caught up with the fire by this time and the boys needed the rest bad, so they were told to show up at 7 a.m. Monday, the 3d. With the exception of cleaning up behind the fire, taking down barricades, throwing limbs off the traveled way, there

was not much to do as far as the highway was concerned, but the wind had shifted and was taking the fire towards Corte Madera. The District Ranger appealed to me for trucks to take the men to Long Valley near Corte Madera. We made two trips with men and helped with the back firing until about 7 p.m. Tuesday, 11th. All but two of the men were back on the granite hauling. Two of us patrolled the road in case any more fires came near the highway.

By Tuesday night the fire was under control. We hauled approximately 2000 gallons of water in putting out the fires. We used a 5-gallon

force pump of the foresters' to reach the burning limbs and in many cases where trees were burning inside we had to shovel dirt to close the lower opening, as it was impossible to battle the flames while there was such a draft. The following is the approximate hours the traffic was halted by our men: 3 to 4 p.m. Friday, August 31; 2.30 p.m. to 5.30 a.m., Saturday, September 1st and for 10- and 15-minute intervals both September 2d and 3d.

DIVISION OF HIGHWAYS DISTRICT VII

Sun Finance Building
Los Angeles, California

Mr. C. H. Purcell,
State Highway Engineer,
Sacramento, California.

Dear Sir:

Our maintenance crew at Guatay in San Diego County did some very excellent work during the recent forest fire along Route 12 in San Diego County. I heard of this on one of my trips through this route, and instructed Foreman Cheeseman to submit a report.

Attached hereto is a copy of this report, dated September 28th, and from what I have heard on the outside, Mr. Cheeseman has rather minimized the good work done by himself and his men during this emergency.

I would particularly call your attention to the excellent judgment shown by Mr. Cheeseman in the saving of the large trees along the state highway. With all of the rest of the area burned off, the value of these remaining trees along the highway is increased several fold.

In such a time of rush and hurry there are not many men who would think out the situation as clearly as did Mr. Cheeseman, and direct his efforts so as to be of maximum benefit to the highway and to the public.

Yours very truly,

S. V. CORTELYOU,
District Engineer.

An Unusual Culvert Job; Details Told of Unique Project

By E. T. SCOTT, Assistant District Maintenance Engineer.

South of Irvine on the Los Angeles to San Diego Highway a double 10-foot by 6-foot reinforced concrete box culvert was recently enlarged by deepening the existing barrel 6 feet. The culvert was inadequate to handle storm waters so its capacity was almost doubled. In addition to deepening the structure it was lengthened to allow for a clear width of roadway between headwalls of 50 feet by extending 13½ feet on each end.

As it would have been difficult and expensive to have detoured traffic while work was in progress, all vehicles were permitted to proceed as usual over the



How the job was handled.

pavement. In fact, there was but little evidence from the traveled way that the work of deepening the old culvert was in progress.

The deepening of the existing double 10-foot by 6-foot concrete box culvert to 12 feet was done in four sections approximately 7 feet each in length and extending the full width of both barrels of the culvert, the total length of the barrel of the culvert being 27.9 feet. Work was started on a 7-foot section at one end of the structure and completed before excavation on the section at the opposite end of the structure was commenced. A lapse of time of a few days, work being shifted to the extension outside the old



The old culvert.

HIGHWAY WORK ALONG KLAMATH IS COMMENDED

Sacramento, California,
November 6, 1928

H. S. Comly, Dist. Engineer,
Calif. State Highway Commission,
Redding, California.

Dear Mr. Comly:

I have just returned from a six-weeks vacation spent at my place at Thompson Creek on the Klamath River. I have made several trips a year down the Klamath for the past twelve years, in fact, when part of the road was not much better than a cow trail.

I want to compliment you on the wonderful improvement made on this road, particularly during the past year. I believe this work is under the supervision of a Mr. Guy McMurry, whom I have not had the pleasure of meeting, but whom I believe must be very capable to get such wonderful results from such a small force of men and equipment.

I spent six years at engineering before going to college to take up my present profession, and can realize how you must have had to stretch your allowance to the utmost to accomplish all this.

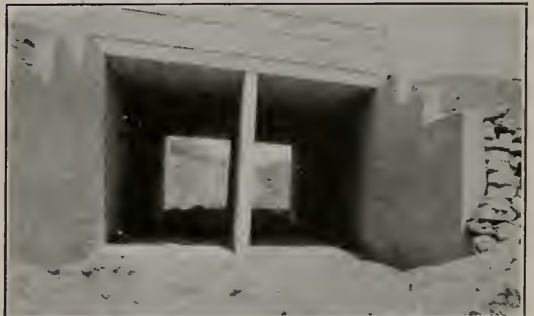
Hoping for a continuance of the good work, I am

Sincerely yours,
C. E. Brown.

culvert, was required between the placing of the two inner 7-foot sections to allow the concrete in the first inner section placed to cure.

While all work of undermining the old culvert was in progress, the structure was well shored up with heavy timber. No caving of the undercutting or settlement of the old structure occurred.

The cost of the 220 cubic yards of concrete placed in the deepening and lengthening of the culvert was \$18.90 per cubic yard and the unit cost for structure excavation was \$1.40 per cubic yard. It cost \$6.20 per cubic yard to break out the concrete bottom of the old structure by hand. The job was too small and isolated to import a compressed air outfit to break out the old concrete.



The new structure.

Excavation by Means of Tunnel and Trapping

By E. H. HENRY, Superintendent of Convict Camp No. 12.

ON NOVEMBER 1, 1927, operations were actively resumed on the construction of the new highway between Greenhorn Mine and Buckhorn Summit, thus translating the vision into practical results in the way of connecting the long needed and much sought for lateral connecting the Pacific Highway with the Coast Route, into a reality.

At the time operations were started on this road there was a company of approximately 120 San Quentin convicts employed.

Equipment being limited and having only one $1\frac{1}{4}$ -yard gas shovel, it was decided to handle this moving of material, which in most

places consists of decomposed granite, by a less expensive method than by hand.

The method decided upon was by tunneling and trapping, the method being sometimes known as by Swede tunnel; therefore, tunnels were constructed in the manner used by miners, namely timbering with lagging and caps, a trap being placed in the roof of the tunnel, through which the muck was run into Swede cars, which were pushed and dumped by man power, a track having been placed from within the tunnel to the end of the fill to be made. See illustration No. 1. Very gratifying results were obtained by this method. Where the grades were steeper and the hauls longer, a horse was used for propelling the cars.

Illustration No. 2 shows a cut being put through by this method, and shows where the muck has slid down to the top of the trap, which it readily does, especially in dry weather, when it runs like sugar. The material is loosened with very light shots, to avoid possible damage to the tunnel, and also bringing down too much material at one time.

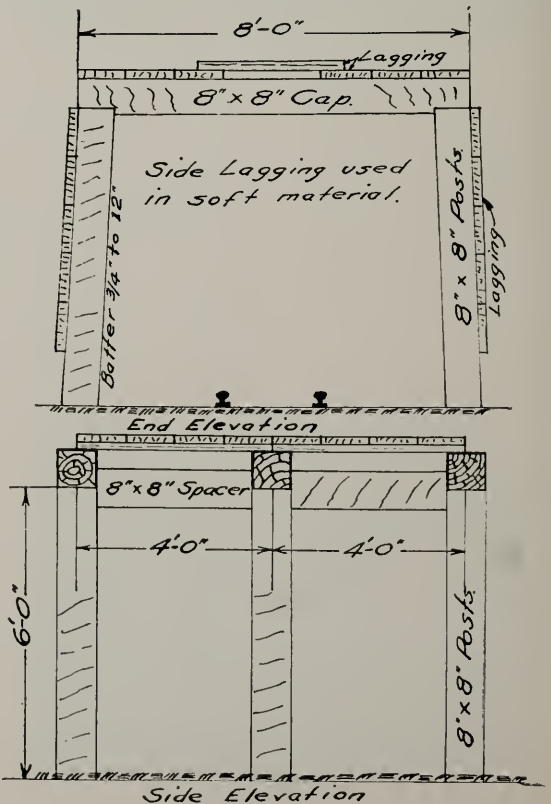
Illustration No. 3 shows the men at work pulling down material and keeping it running to the trap; sloping is done at the same time.

Illustration No. 4 shows a cut, half of which has been removed by the trap method, the tunnel timbers and trap from this work having been salvaged for use in a tunnel which is being driven in from the opposite end of this cut. When the work from the opposite end meets the work shown in the picture, the cut will be complete except for a small amount of clean up work, which will be handled with a power shovel. Generally speaking, the slopes will be completed to within approximately 15 feet of grade, and this material near the bottom of the cut, that has to be handled with a shovel, only amounts to from three to nine yards per foot.

Following are some interesting facts relative to the tunneling and trapping methods, which will show the relative cost of operations per cubic yard of material moved, which covers the cutting and handling of lagging and timbers, cost of driving tunnel, and cost of



E. H. HENRY.





Views illustrating methods of procedure.

trapping operations for one of the cuts put through on this job.

The tunneling and trapping system was first inaugurated about March 1, 1928, and there have been about four crews of approximately nine men to the crew at this work since that date, with an average of about $12\frac{1}{2}$ cubic yards per man-day.

The quantity of powder used in connection with this operation averages about one-quarter pound to the cubic yard of material.

Cutting and Handling of Lagging and Timbers, 129.5 Lineal Feet Tunnel.

Free labor	-----	
Convict labor	-----	\$92.40
Equipment	-----	
Gas and oil	-----	
Material	-----	
Total cost	-----	\$92.40
Unit cost	-----	\$0.713

Driving Tunnel 129.5 Lineal Feet.

Free labor	-----	\$25.63
Convict labor	-----	189.00
Equipment	-----	16.50
Gas and oil	-----	1.65
Material	-----	36.68
Total cost	-----	\$269.46
Unit cost	-----	\$2.08
Total cost of driving tunnel per lineal foot	-----	\$2.793

Trapping 13,620 Cubic Yards.

Free labor	-----	\$325.12
Convict labor	-----	2,281.67
Equipment	-----	28.86
Gas and oil	-----	15.34
Material	-----	567.76
Total cost	-----	\$3,218.75
Unit cost	-----	\$0.2628
Actual cost	-----	\$0.2628
Overhead	-----	0.058
Inventory	-----	0.015
Distributable	-----	0.045
Total cost (per cubic yard)	-----	\$0.3808

Los Angeles, Cal.,
October 15, 1928.

California Highway Commission,
Sacramento, Cal.

Gentlemen:

In the maze of complaints which you get from all over the state regarding conditions, from taxpayers who are self-constituted advisers, it must be a delightful experience to have an epistle which commends a policy or an employee.

And so I am writing you to call your attention to a service given me, outside of his official duties, by your superintendent of maintenance at Crescent City, Mr. N. Underwood.

Some time last summer, while on a trip from Crescent City to Grants Pass, we left a child's silver drinking cup at one of the service stations near the Oregon mountains.

We did not discover the loss until some time later at a distance removed from the place to make it impracticable to return for it. On my return to Los Angeles I wrote the Oregon Highway Commission asking their good offices in the cup's recovery, thinking the loss had occurred in the state of Oregon, and they kindly forwarded the letter to Mr. Underwood.

Yesterday's mail brought the cup and a letter from Mr. Underwood, which I am acknowledging.

I could not let the occasion pass, however, without writing you a letter also calling your attention to Mr. Underwood's kindness. I am sure you have not made a mistake in having a man of his thoughtfulness in charge of the maintenance work of the district.

Sincerely yours,

ROY A. McMILLAN.

2340 Prosser Ave.,
Brentwood Heights Sta.,
Los Angeles, Cal.

WYOMING—In estimating annual state road maintenance requirements fifteen dollars a mile is assigned for cleaning culverts, based on an average of ten culverts to the mile.

To Save Trees-Shrubs Along State Roadsides

No unnecessary cutting of trees and shrubs along the state highway system.

This is the edict that has been issued to highway forces generally by B. B. Meek, Director of the Department of Public Works, and C. H. Purcell, State Highway Engineer.

The instructions against unnecessary and promiscuous cutting of shrubs and trees are a part of the campaign inaugurated by Director Meek, to preserve the natural beauty of highway borders, which he declares is equally as important as making the highways beautiful.

The "Keep the Highways Beautiful" instructions issued by State Highway Engineer Purcell to all district engineers follow:

The following measures are set forth for your guidance and close observance, not only as an aid in improving the appearance of our roadsides, but the preservation of their natural beauty as well:

1. In daylighting the road, brush or trees shall not be cut on the upper side of the road where the cut bank itself prevents visibility. Exception is made to locations of heavy rainfall where accompanying winds might dislodge trees, causing damage to roadway or hazard to traffic.

2. Trees on the lower side of road shall be cut only when pruning will not give the desired visibility. Undergrowth, interfering with visibility, should be removed, the extent of this removal to be limited to a minimum.

3. All tree and brush cutting to be done in the late fall or during the period of least traffic, and the slash burned in time to allow new growth to come up the following spring, covering both the scars of cutting and site of burning.

4. When necessary to cut a tree, the cut should be made flush with the ground. Existing stumps, except redwood and others of large diameter, should be treated in a similar manner.

5. Ferns, flowers and moss growth on the cut bank and along the highway, except where they present a distinct fire hazard are to be disturbed as little as possible.

6. Trees, shrubs, and where conditions and facilities permit, wild flowers, common to the locality, shall be planted along the fence enclosure of each highway maintenance station as an illustration of the state's desire for beautifying the highways.

7. The trimming and pruning of trees and brush in each district shall be laid out and supervised by a responsible man, instructed to the work in hand by the headquarters arboriculturist.

8. That as soon as practical a section, representing average conditions, one mile or less in length, shall be selected in each district and treated as outlined above. On completion, this section to be reviewed as an object lesson by the various maintenance foremen in that district.

9. Where a distinct fire menace exists, the traveled way, to a point on the cut bank two feet above the gutter line, should be cleared of all dry vegetation.

Roadside Clean-up Campaign Progressing

Progress is reported in the clean-up and beautify the roadsides campaign, launched under the leadership of the Automobile Club of Southern California some months ago. This response from the various communities indicates that a decided improvement will be noted in the coming months by tourists and motorists generally.

In some communities the definite job of removing untenanted, dilapidated shacks, old signs, dead trees, dumps, and similar wayside disfigurements has been placed in the hands of civic organization committees. Chambers of commerce are realizing their responsibilities and planning programs that not only will clean up the roadsides but keep them clean.

It is noted as the campaign progresses that in many instances the municipal government itself is responsible for permitting city dumps, automobile graveyards and similar eyesores to exist. In other communities ordinances are being especially framed, to improve the situation.

Service clubs are aiding in the campaign and motorists generally are urged to do their bit by keeping the roadsides free from litter and refuse.

Trees Along State Highway are Saved

[From the *Red Bluff Times*.]

Only one tree shading the east side highway will be cut down, according to word received here yesterday by Elmer Stump, resident engineer for the California State Highway Commission.

Removal of several fine trees that border the road had been asked by certain interests, but public opinion expressed to the Commission prevented the act. The tree in question stands about five miles north of Los Molinos, and is considered too close to the highway, already forcing up the pavement.

Other trees within six feet of the highway are to be posted with flashing red signs.

MICHIGAN—Electric lights now aid night motorists on 375 miles of highways outside of cities and towns, it is reported.

ILLINOIS—Among the state paving and bridge contracts let during June and July are fifteen at more than \$150,000 each, the largest being for \$344,000.

CLEVELAND—A regional highway plan anticipating a traffic growth of 73 per cent in ten years has been prepared. It includes 125 miles of new and 468 miles of reconstructed routes, 55 grade eliminations and 18 bridge projects. The cost is estimated at \$63,000,000.

State Highway Officials of Nation Express Views on Highway Policies

CALIFORNIA was represented this year at the National Association of State Highway Officials, held in Chicago in November, by C. H. Purcell, State Highway Engineer; C. S. Pope, Construction Engineer, and T. E. Stanton, Materials and Research Engineer, all of the Division of Highways, Department of Public Works.

The discussions covered a wide range of subjects pertaining to state highway policies and affairs. The conclusions of the association were embodied in a series of resolutions printed below and dealing with the following subjects:

- Toll bridge legislation;
- Regulation of motor buses and trucks;
- Road funds for national parks;
- Concentration of federal funds on federal-aid system;
- Federal funds for roads through federal lands;
- Advertising signs on highways;
- Cooperation from states in geological surveys.

A resolution eulogizing the memory of A. B. Fletcher, former State Highway Engineer of California, was also passed.

Mr. Purcell was selected as a member of the Executive Committee of the association.

Following the conclusion of the session of the convention, Mr. Pope and Mr. Stanton spent some time in the east, studying highway development in various states there.

TEXT OF RESOLUTION

The following resolutions were adopted:

Needed Toll Bridge Legislation.

WHEREAS, Private financial interests are undertaking to commercialize and exploit the traffic on the roads of the state and federal aid highway systems by the construction and operation of toll bridges at points where traffic is concentrated as a result of the vast expenditure of public funds on the construction of these free highways, and

WHEREAS, These interests in order to further their own schemes have actively opposed construction and financing bridge programs of properly constituted public authorities; now, therefore, be it

Resolved, That the American Association of State Highway Officials in convention assembled at Chicago, Illinois, on November 14, 1928, is unalterably opposed to privately owned and controlled toll bridges on the state and federal aid systems of highways, but is not opposed to publicly constructed, owned and operated toll bridges where adequate public funds are not available for the immediate construction of the free bridges needed to complete the interstate and intrastate highway systems as planned; and be it further

Resolved, That this association recommend a thorough investigation of the entire toll bridge situation by

the Committee of Congress handling federal highway legislation to the end that suitable remedial legislation may be promptly enacted; and be it further

Resolved, That this Association recommend to the Committee on Interstate and Foreign Commerce of the Congress of the United States that it withhold its approval of any measure authorizing or consenting to the construction of a privately owned toll bridge on the state or federal aid highway systems unless after a thorough investigation the committee has determined that there is a lack of financial resources or intention of the proper political subdivisions to finance and construct a free or publicly owned toll bridge; and be it further

Resolved, That this association recommends that there be included in every congressional authorization or consent for the construction of privately owned toll bridge on the state or federal aid highway systems, a provision that the bridge when completed may be acquired by the public at any time by the payment of an amount not greater than its original cost, less reasonable depreciation due to use and the cost of replacement of faulty construction and design.

Regulation of Motor Buses and Trucks.

WHEREAS, The use of the highways of the United States for commercial motor bus and truck interstate traffic is rapidly increasing, and

WHEREAS, No definite national policy has been adopted providing for the regulation of such interstate traffic over such highways.

THEREFORE WE RECOMMEND, That authority to delegate interstate highway traffic be vested in the states with such national legislation as may be enacted providing for the central government as arbitrator of disputes that may arise between the states.

WE FURTHER RECOMMEND, That before any legislation is enacted by congress that a thorough investigation be made of all modes of interstate traffic by state and federal agencies already established.

Increased Federal Funds.

WHEREAS, That rate of progress of construction of federal aid highways is not keeping pace with the increase of motor vehicle traffic, and

WHEREAS, There is an economic necessity for making greater progress in the building of the federal aid highway system; therefore, be it

Resolved, That we urge the congress to increase the federal aid highway appropriation to \$100,000,000 for each of the fiscal years 1930 and 1931 and that the appropriation for forest roads be increased to \$10,000,000 annually in order to make possible the early completion of the entire system.

Road Funds for National Parks.

WHEREAS, The completion of arterial highways through national parks and monuments is of prime importance; now, therefore, be it

Resolved, That the association go on record as favoring the continuation of federal appropriations of \$5,000,000 per year for construction, reconstruction and improvement of roads and trails in national parks and national monuments until modern, high standard roads and adequate trail systems are provided therein.

Concentration of Federal Funds on Federal Aid System.

WHEREAS, There is an effort now being made to increase the mileage of the federal aid system of highways, and

WHEREAS, The records show that less than 47 per cent of the mileage of the federal aid system is surfaced with gravel or a higher type; therefore, be it

Resolved, That this association recommend that the federal funds be concentrated on the present federal aid system.

Federal Funds for Roads Through Federal Lands.

WHEREAS, The progress being made in the construction of the United States forest highway system and

the roads across other unappropriated public lands in the various states is lagging behind that being accomplished on other portions of the federal aid highway systems in such states; and

WHEREAS, The complete improvement of said United States forest highway system and the roads across other unappropriated public lands, many sections of which are important interstate transcontinental links would not be accomplished under present appropriations until many years after the completion of the balance of the federal aid highway systems in such states; and

WHEREAS, A resolution was passed at Denver, Colorado, by this association in 1927 calling the attention of congress to the above conditions and urging that increased monies be appropriated by congress to the end that the completion of the United States forest highway system and roads across other unappropriated public lands might be accomplished at approximately the same time as the balance of the federal aid highway systems in such states and result in a continuous improved system of highways with no weak links, and

WHEREAS, Pursuant to the above resolution, legislation was introduced in the congress to carry out these purposes; and

WHEREAS, Said legislation known as the Colton-Oddie bill passed both the Senate and the House but failed of complete enactment; and

WHEREAS, The comparative rates of progress being made on the two systems are as they were in 1927 and the appropriations are the same as heretofore; therefore, be it

Resolved, That this association affirm our support of the principles incorporated in the Colton-Oddie bill and urge its enactment into law.

Advertising Signs on Highways.

WHEREAS, Advertising signs along highways not only destroy the scenic beauty but create as well a serious traffic hazard by distracting the attention of drivers; therefore, be it

Resolved, That we reaffirm the position previously taken by this association against the encroachment of advertising signs and that in the interest of safety and promotion of scenic beauty we urge the several states which have not already done so to bar all advertising signs from the highways and vicinity thereof by legislation prohibiting such advertising signs within a distance of at least 500 feet (500') of the rights of way of all highways.

States Should Cooperate in Geological Surveys.

WHEREAS, The United States Geological Survey has an appropriation enabling it to make topographical surveys for states which will share equally in the cost; and

WHEREAS, Such surveys would be of great value to the public in general and to the several state departments, including the highway departments.

WE THEREFORE RECOMMEND, That the states avail themselves of this cooperation of the federal government, so that these surveys may be completed as early as possible, and

WE FURTHER URGE, That the federal government complete the topographical surveys of the public lands at its own expense.

In Memory of Austin B. Fletcher.

WHEREAS, Austin B. Fletcher, one of the charter members of the American Association of State Highway Officials passed away at Washington, D. C., on March 9, 1928, and

WHEREAS, Mr. Fletcher was one of the notable highway engineers of the United States, embodying in himself both the high ideals of his profession and its outstanding service to state and nation; therefore, be it

Resolved, That the American Association of State Highway Officials extend to the relatives of Mr. Fletcher in their great sorrow the heartfelt sympathy of its members; and expression be given to the sorrow that the members of this association feel in the loss of a personal friend and a most honored and able member of their profession; be it further

Resolved, That a copy of this resolution be spread upon the minutes of the association as a lasting tribute both to a life well lived and to a career, a monument to which are better highways the nation over.

WASHINGTON, D. C.—The streets and boulevards of the National Capital are lined with 105,123 well kept shade trees, a census shows. A recent appropriation will add 3500 more.

STATE CREW PRAISED FOR FIRE FIGHT

(Continued from page 18.)

The trees were pine trees, Sta. 837+00, Sec. D; oak, Sta. 18+50, Sec. F; oak, 28+00; oak, 136+00; oak, 143+00; oak, 133+00; oak, 184+00; oak, 188+00. In several cases we cut underbrush from the tree and kept the fire from getting started in a tree, or back-fired from a clump of trees. There were several that first had a burning limb, that we cut off or used the force pump and did not take much time. But the above trees would have burned down to the ground. The boys all put up a good fight, and the district ranger was very much pleased with the results obtained, thanked us for use of equipment and men for crew leaders.

Two of our employees tried to be as stubborn as the fire while the cabins were on fire in Pine Valley, and they had to be carried out. A bucket of water and plenty of fresh air brought them out in short order.

THE ROAD HOG.

There is a creature that is allowed to run loose on the highways of every state, who has probably been the cause of more oburgation on the part of motorists than any other one thing in Motordom. It thinks that the United States Government, the State Highway Commission and all other road-building agencies have expended millions of dollars to construct highways for its own personal use. This creature is known as the Road Hog. It has the human form but none of the characteristics usually attributed to those above the lower animals.

It travels along the middle of the highway usually in a heavy car but sometimes in a car not so heavy and nothing short of fear of hurt to its own thick hide will cause it to give the proper share of the road to others.

It has been known to go to a headlight adjusting station, have the lights on its car properly adjusted, receive a certificate for his protection and then deliberately change the focus and tilt of the lights so that they will blind an oncoming motorist and force him off the road.

If traveling towards you it will try to bluff you into giving way for him and if you are overtaking it, no amount of honking on your part will cause it to get over one iota.

Just a word of warning. Sometimes particularly on a narrow road, you think the other fellow is hogging when you are doing it unconsciously. This is particularly apt to be so if you are driving a car to which you are not accustomed. A slight change in the elevation of your eyes or of the contour of the road is very apt to cause you to misjudge your distance from the right hand edge of the road. Be sure to keep well over to your own side of the road in passing.

—Berkeley Traffic Safety Commission.

IMPROVED HIGHWAYS AID DEVELOPMENT AT LAKE TAHOE

(Continued from page 9.)

vacation months of June, July and August. As a recreational road through a scenic area the location and construction call for a sacrifice of some of the engineering principles used on a high-powered commercial road in order to protect and display the scenic beauties of the country traversed. It is necessary, however, to adhere to those principles of location and construction that affect the safety of the road, for experience indicates clearly that even through a scenic country a fair per cent of the traffic moves at high speed. While it may become desirable or necessary to restrict by law the speed of traffic in the recreational areas, it will never be wise to let down on the standards by which safety is built into the roads. However, the necessity of saving distance, or of eliminating unnecessary rise and fall is not so important; therefore, the locator may exercise considerable latitude in laying out the road to take advantage of strategic points where the most magnificent views will be available to the traveler. In general in the Lake Tahoe area the principal restriction to getting the best to be had from a scenic point of view is the fact that private ownership makes any movement of the road from the position of the rather meandering route of the old road a difficult problem. An unfortunate event in the history of Lake Tahoe has been the acquisition of all of the land fronting on the lake by private owners, and the designation by these owners of the location of the road across their property as most suited their convenience. The result was a rather haphazard road, from which departures could be made to a limited extent only. By retaining the old locations of the road at the strategic places such as along the lake front, or where the best views could be obtained and modifying the intervening location as much as practicable, a road has been secured that will present to the traveler beautiful vistas of the lake through the trees, close-up views along the beach, and magnificent panoramas of lake and mountain from the higher elevations. Easy curves through wooded areas have been used in preference to tangents, and the display of a straight gash through the forest has been avoided. Wide roadside areas are being provided for parking where the best views are to be obtained. All standing or fallen dead timber and brush is being removed from the 80-foot right of way and burned. Cutting of live trees is restricted to the area needed for roadway. The effect of this preservation of timber and roadside clean-up in added attractiveness is remarkable, for new vegetation springs up that could not thrive before, and the roadsides present the appearance of a beautiful natural park.

The character of work done to date in this area will be continued until all of the highway around the lake is completed. The next units for improvement will undoubtedly be a 5-mile section from the Meyers-McKinney road to the state line at Lakeside, and a section of about 1.5 miles at the head of Emerald Bay. This latter unit will constitute one of the most scenic roads in California overlooking, as it does, Emerald Bay and Lake Tahoe with a background of Mt. Tallac and other rugged peaks.

The people of California have been given a demonstration of how traffic service can be improved by new construction and by better maintenance. They have responded with an increase in traffic that calls for a continuation of the construction and for constant

vigilance on the unimproved roads to equal or better the standard of maintenance that has been set. It is the aim of the employees of the Division of Highways to see that they are not disappointed.

HOW HIGHWAY BRIDGES ARE INSPECTED

(Continued from page 5.)

inspected while being made. Then pieces of steel from each unit of manufacture are given a physical and chemical test. When the steel is fabricated, or put together to form parts of the truss, it is again inspected to see that proper sizes and length of materials are used. Before shipment the steel is given a shop coat of paint prior to the two additional coats which are applied in the field after erection. This paint is subjected to a chemical test before application and the application closely watched to insure that no dirty or rusty steel is covered and to see that all parts are thoroughly painted to guard as much as possible against the ravages of rust. The steel as assembled is then weighed in the presence of the inspector before shipment. Payment is based upon these weights. Then, when the steel arrives at the bridge site the erection is inspected to see that it is properly built in place. When riveted, each rivet is tested after being driven to see that it is tight that it may function properly as designed. Great care is then taken to see that the steel work is properly painted for in this case when you save the surface you save all.

CONCRETE TESTED

Concrete is similarly tested except that concrete differs from steel in that it is manufactured on the job. The cement is tested at the cement mill before it is allowed to be shipped to the bridge site. The aggregate is inspected and tested for strength and grading. Proper proportions to be used are determined by the engineer in the field. The water that is used is subjected to a chemical test and the amount used in the concrete is inspected. The mixing and placing of the concrete is then inspected by the engineer.

All the other materials are likewise inspected and tested—timber, piling, reinforcing steel, bronze expansion plates, machinery, electrical apparatus, etc.

The intent of the foregoing is to describe in a general way the "what and why" of bridge inspection. Necessity and sufficient funds are prerequisite to a bridge; plans and specifications follow. Competent bridge inspection then insures efficient and economical bridges and for existing structures insures safety for the traveling public.

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Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

B. B. MEEK.....Director
GEORGE C. MANSFIELD.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

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DIVISION OF HIGHWAYS DEPARTMENT OF PUBLIC WORKS STATE OF CALIFORNIA

C. C. YOUNG, Governor

B. B. MEEK, Director, Department of Public Works
CORNING DE SAULES, Deputy Director, Department
of Public Works

C. C. CARLETON, Chief of Division of Contracts and
Rights of Way

GEORGE C. MANSFIELD, Editor, California High-
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T. H. DENNIS, Maintenance Engineer

CHAS. E. ANDREW, Bridge Engineer

R. H. STALNAKER, Equipment Engineer

E. R. HIGGINS, Chief Accountant

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H. S. COMLY, District II, Redding

F. W. HASELWOOD, District III, Sacramento

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F. G. SOMNER, District IX, Bishop

R. E. PIERCE, District X, Sacramento

General Headquarters, Third Floor, Highway Building,
Eleventh and P Streets, Sacramento, California

Would Adorn State Roads With Outside Christmas Trees

The cover for this issue of CALIFORNIA HIGHWAYS AND PUBLIC WORKS features the movement for OUTDOOR CHRISTMAS TREES which is sweeping California. Not only are there outdoor trees being urged for homes, but each community is being asked to have a Christmas tree, properly decorated somewhere along the state highway that serves that particular city.

It is urged that these outside Christmas trees will not only radiate the cheer of the holiday season, but will also advertise to the world California's salubrious Christmas climate.

The drawing for the cover was made by E. M. Muse of the Division of Highways.

Select Model Areas For Roadside Beautification

The Maintenance Department of the Division of Highways is now conducting a survey of state highway roadsides upon which to base a "clearing and cleaning up" program for the coming year.

In each of the ten highway districts of the state, a portion of road is being selected to serve as a model section for roadside beautification. These sections will be planted with trees and shrubs suitable for each locality, and having regard both to soil and climatic conditions that prevail there. It is thought that these sections will serve as typical examples and guides of proper and practical methods to follow in roadside betterment and beautification, and will benefit both the highway organization and county and community organizations.

STOP, LOOK, LISTEN

He heard the toot, but tried to scoot

And beat the choo-choo to it.

The poor galoot now twangs a lute;

Take heed that you don't do it.

—Georgia Highways.

NEBRASKA has built 3246 miles of gravel highways in the past four years. Their annual maintenance cost has averaged \$405 per mile. On twenty-two of the most heavily traveled routes this figure is \$570, not including major repairs and resurfacing. Cost of resurfacing has averaged \$873 per mile.

U. S. May Lend Road Engineers to Neighbor Nations

The Pan American Union has expressed hope for the enactment of a bill which will come before the U. S. Senate during the next session and which would authorize the President to detail engineers from the Bureau of Roads to assist Latin-American governments in highway matters.

This bill, which was introduced by Senator Oddie of Nevada, was considered by the Senate Committee on Post Offices and Post Roads during the last session and was reported to the senate with the committee's approval. It retains its parliamentary status on the legislative calendar and will come up for consideration at the next session.

DR. ROWE SUPPORTS BILL

A letter from Dr. L. S. Rowe, Director General of the Pan American Union, addressed to Senator Oddie, expresses the hope of the Union for favorable action on this bill as follows in full text:

"I understand that the measure providing for the appointment of highway engineers for service in those Latin-American countries that may request the assistance of such engineers will shortly come before the committee.

"I hope that this measure will receive the favorable consideration of the committee and that it will also receive the approval of congress. The Pan American movement rests on the basis of mutual helpfulness and cooperation between the Republics of the American continent and on the principle of having the benefit of the experience of each placed at the disposal of all the Republics. I feel that the adoption of this measure will constitute a real service to the cause of Pan Americanism, inasmuch as it will place at the disposition of all the other Republics the experience of the highway engineers of the United States."

COMMITTEE EXPLAINS BILL

The senate committee's report recommending enactment of the bill explains the purposes of the measure and cites a statement of President Coolidge in his last annual message to congress as favoring such legislation. That part of the report follows in full text:

This bill would authorize the President of the United States, upon application from the foreign governments concerned and whenever in his discretion the public interest renders such a course advisable, to detail engineers of the Bureau of Public Roads of the Department of Agriculture to assist the governments of the Republics of North America, Central America and South America and of the Republics of Cuba, Haiti and Santo Domingo in highway matters.

The present law provides that the President may detail officers of the United States Army, Navy and Marine Corps to assist the Latin-American Republics in military and naval matters. This bill is drawn with the exact wording and authorization as that with respect to officers of the Army and Navy. (See senate hearings before Committee on Post Offices and Post Roads, March 30 and 31, 1928, pp. 4-9.)

The President in his message to congress on December 6, 1927, called the attention of the congress to the situation and to the advisability of authorizing him to have the same power with reference to engineers in highway matters as he possesses with respect to the

CALIFORNIA CONTRIBUTION TO HIGHWAY BUILDING LAUDED BY U. S. ENGINEER

(Continued from page 13.)

The maintenance cost is not yet completely known, but it is not expected to exceed the cost of maintenance by other less effective methods. It will consist in patching and possibly reworking some sections that are either too lean or too fat.

There is no reason that the new oil processing can not be applied to new construction as well as existing older roads. It will be necessary to have the lower layer thoroughly compacted by travel, say for a depth of four or five inches. With a minimum amount of scarifying, the top layer of fine material may then be processed.

Whether or not the oil-processed top can take the place of good penetration macadam remains to be seen. The best penetration macadam or bituminous macadam, six inches thick, can now be built in the west at a cost of from \$1 to \$1.25 per square yard. The bureau is doing fifty-three miles for which the average cost for six inches is \$1.20, and is regarded as high due to scarcity of surfacing stone and high freight.

The oil-processed roads complete with a processed top of two inches, on a four-inch compacted base, will cost about 84 cents per square yard, with comparable prices for stone. With an apparent difference of from 25 to 40 cents per square yard in the cost of the two types, the item of relative maintenance costs becomes important.

Nevertheless the oil-processed top has arrived in point of time and is going to stop forthwith a great annual loss on many miles of fine crushed roads in the west.

officers of the Army and Navy. The President's message relating to this matter contains the following:

"While the advantage of having good roads is very large, the desire for improved highways is not limited to our own country. It should and does include all the Western Hemisphere. The principal points in Canada are already accessible. We ought to lend our encouragement in any way we can for more good roads to all the principal points in this hemisphere south of the Rio Grande. It has been our practice to supply these countries with military and naval advisers, when they have requested it, to assist them in national defense. The arts of peace are even more important to them and to us. Authority should be given by law to provide them, at their request, with engineering advisers for the construction of roads and bridges."

REDUCING ACCIDENTS ON STATE HIGHWAYS

(Continued from page 11.)

locally "in and out ditches," indicating that a vehicle can drive in the ditch in case of necessity and still come out without accident.

PAVEMENTS

Engineers have recognized the value of wider pavements for the purpose of eliminating accidents. It is now almost universal practice to super-elevate and widen all curves and this has been recognized as an important contribution to highway safety. There is no reference made to different types of surfaces in connection with highway safety.

LEGISLATION

In some of the states elaborate measures have been passed or are being passed by legislatures for the purpose of regulating traffic and pedestrians and to assist in the prevention of highway accidents.

LICENSING DRIVERS

One detail of legislation referred to by many of the states is that of licensing drivers of vehicles after passing examinations showing they are able to drive such vehicles. The examination would require knowledge of the rules for the use of the highways, speed limits, as well as the ability to satisfactorily operate an automobile.

SPEED LIMITS

Speed limits vary widely in the different states, ranging from practically a limitless speed to 15 or 20 miles per hour.

TRAFFIC PATROL

Traffic patrol systems have been adopted by many states, and are advocated by many others.

ENFORCEMENT

In certain states we find that the prescribed legislative traffic regulations are enforced, while others do not take them seriously.

A few of the states have referred to the enforcement program which will take place following the educational campaign. They feel that the highway commissions should first construct the roads in a manner that will remove from the highways the maximum number of hazards. The user of the highway should then be regulated in such manner as to guarantee safe passage for himself and other users of the highway when the proper legislative requirements are respected.

EDUCATIONAL WORK

Several states have actually commenced educational campaigns for the purpose of instructing drivers and pedestrians how best to use the roadways and have the least number of accidents. In some of the states elaborate educational campaigns are being carried on.

NEW YORK—The Westchester County park system, which has been developed to beautify the region and relieve traffic north of New York City, has been provided with 140 miles of new boulevards and nearly 200 grade separations. Highway bridges have been given notable architectural treatment.

Roadside Planting To Improve Main Highways

The act, passed at the last session of congress, which permits the federal government to pay half the cost of wayside planting along federal-aid highways, will give considerable impetus to the movement long fostered by women's clubs and other social organizations, and its effect will quickly be evident in an improvement of the appearance of the main interstate roads, according to the Bureau of Public Roads of the United States Department of Agriculture.

Latest available figures show that 25 states have no laws governing tree and shrub planting along highways. A few of the remaining 23 have good laws, but the majority have indifferent ones.

The Massachusetts Department of Public Works, and the highway and forestry departments of other states, have already demonstrated how much can be done at small cost to beautify the roadsides by judicious planting of native trees, shrubs, and perennial flowers.

The Massachusetts Department is empowered by law to make roadside improvements, the work including such planting, replacements, and care as may be necessary. When a road is laid out as a state highway, it is generally made sufficiently wide to provide an area on each side of the traveled portion for roadside improvement. No tree, shrub, or plant within such a highway can be cut, removed, or new ones added without a permit from the highway department.

The work of roadside improvement in Massachusetts is done by the maintenance division. The cost is included as a part of the regular maintenance expenditure of the state. The state has a nursery at Palmer, where trees and shrubs are propagated and where the highway landscape supervisor trains men in the care of trees and roadside beautification.

Public acquisition in all states of suitable tracts of land along the highways for state parks, for purposes of recreation and conservation of timber and animal life, and the acquisition of small road-bordering strips and plots for development of parkways and parklets, says the bureau, would enhance considerably the appearance of the roadsides.

California Leads In Increase In Gas Consumption

California is leading all states in the Union in the increase of gasoline consumption by motorists, according to reports of the U. S. Department of Agriculture. These show that during the first six months of the present year the state showed a gain of 39,000,000 gallons in gasoline consumption by motorists, which is approximately an 8 per cent increase over last year. Texas ranks in second place and Ohio is third.

The revenue collected in gas tax the country over for the first half of the year passed the \$140,000,000 mark, which is some \$39,000,000 more than collected in gasoline taxes the first six months of last year. Nearly every state in the Union showed a gain in consumption.

The average tax the country over is 3.02 cents, compared with the average of 2.55 cents during the first six months of last year. Of the \$140,000,000 collected all but \$5,630,000 will be used in the construction and maintenance of state and local roads.

MAKING THE HIGHWAYS OF CALIFORNIA SAFE

(Continued from page 10.)

effectiveness and observance are placed only at points of actual necessity.

ARTERIAL STOPS

While it is true the installation of arterial stops has in some instances perhaps been overly ambitious, the soundness of this safety measure is best confirmed by its general observance. Early in 1927 the Division of Highways undertook to interest the various counties in these installations at important roads intersecting the highway, as a means of safely expediting the traffic. County officials were advised of the roads to be signed and provided with copies of statutes governing their adoption. The response has been general and has done much to improve the condition and safety of traffic.

PROTECTING THE SCHOOL CHILDREN

During the past year "School Slow" signs have been painted on the pavement either side of all school buildings fronting our highways. This single measure has done and will continue to do much for the protection of school children.

GUARD RAILS

Guard rails along narrow grades and steep embankments and at other critical points are installed. A very strong guard rail has been developed by our engineers, consisting of 8 by 8 inch posts and three 2 by 6 planks laminated. These guard rails are placed securely in the ground and are painted white. This particular design is but little more costly than other types and has proved more effective than any of them. In addition to this guard rail, culvert ends are marked by 6 by 6 inch posts painted white so that motorists are aware of the usable road width.

Furthermore we have learned that the psychology of the motorist causes him to keep away from a rail and therefore, in order for our bridges and other drainage structures to have the same capacity as the highway, they must be wider than the travelable area. These narrow bridges are responsible for numerous accidents, as shattered glass and mutilated bridges tend to testify. We are widening these structures out just as fast as it is possible to do so, making them a minimum of four feet wider than the highway itself and designing them so that when the highway is widened the structure can again be widened. There are in the state certain bridges with wooden decks which in winter become frosty with conse-

quent danger to traffic. During the past year the surfaces of many of these bridges have been made nonskid by the addition of coarse rock, and the bridge decks of future construction under similar conditions will be made of concrete.

SANDING SLIPPERY PAVEMENT

During the past year many slippery pavements were sanded in the early morning hours by highway crews. Where this condition could be remedied by planing the surface, it has been attended to during the past summer.

CHANGING ROAD CROWNS

The old dangerous high-crowned roads are not permitted in modern highway construction and the sections remaining in the California highway system are being rapidly replaced by crowns so low that the crown is not perceptible to the motorist. At the time of construction efforts are also made to import material so that the deep borrow pits adjacent to these pavements are filled or at least graded to a very flat slope.

GRADE CROSSINGS

The elimination of railroad grade crossings is a very important and definite part of our highway building program. Twenty-six dangerous grade crossings have been eliminated during this current biennium, and this program will be extended during the next biennium. In the meantime, we are, in cooperation with the railroads and the Railroad Commission, having installed improved warning signals.

LIMITING WIDTH OF LOADS

There are, however, certain features, the adoption of which will do much to promote safety on our highways. I have in mind the limitation of the maximum width of load which may be moved over our highways with reference to the available width of travel way. Under no circumstances should overwidth loads be permitted on important highways which would leave less than one traffic lane on paved or surfaced travel way available for the public travel.

A more definite limitation should also be placed on the lengths of loads which may be hauled over our highways based on the grade and alignment of the road to be traveled.

PARKING PROBLEMS

Promiscuous and unregulated parking should also be corrected. With pavements and travel way now being improved in excess of 20 feet, the present law permitting parking, provided it leaves a clear and unobstructed

width of not less than 15 feet upon the main traveled portion of the highway, opposite such standing vehicles, is clearly hazardous to traffic.

USE OF HIGHWAY ROADSIDES

Another feature adding much to the confusion and hazard to traffic is the soliciting or vending of wares along the highway roadsides. A close runner-up for this nuisance is the erection of sign boards along the highways and at important road intersections. Both aim to distract the attention of the motorist and the hazard is in direct proportion to their success in this endeavor.

WOMEN ARE HELPING

Through the California Development Association, two hundred and seventy thousand organized women of California are carrying on a statewide program of education in an effort to reduce accidents and deaths by automobiles, and with their splendid aid these features will no doubt be taken care of, as the public appreciate their importance.

All this is only a part of our program to make our highways in California safer and the best evidence that we are doing this is the fact that deaths attributable to improper construction are steadily being reduced.

Maps Are Prepared Of Federal-Aid Roads

The first series of uniform scale maps ever made showing the status of improvement of the federal-aid system of highways is completed with the exception of California and Texas, and is ready for distribution, it has just been stated by the Bureau of Public Roads of the Department of Agriculture.

The statement follows in full text:

Maps of the two states will be finished in a short time. The maps show the status of improvement of the federal-aid highways system in each state regardless of whether the construction has been done with the aid of the federal government, by state, by county or by township. A system of symbols indicates the type of improvement of all roads and whether the work was done with or without the assistance of the federal government.

The maps which are called progress maps and are to be published periodically to register any change in improvement of the highways, are prepared on sheets of uniform size, some states requiring two, and are so bound that they may be punched and placed in a loose-leaf binding.

UTAH—The longest highway tunnel in the world—more than a mile—is being constructed as part of the new Zion-Mt. Carmel Highway in southern Utah.

Methods Discussed To Protect Roads Against Landslides

AS RESULT OF a study of landslides and their relation to highway building, the Bureau of Public Roads, Department of Agriculture, has concluded that preventive measures, particularly drainage, should be substituted for retaining structures. The study was made in sections of West Virginia, Ohio and southwestern Pennsylvania.

The full text of the conclusion of the report, prepared by George E. Ladd, associate geologist, follows:

The most important conclusion resulting from the study of slides in this district is that, generally speaking, preventive measures should be substituted for retaining structures.

Usually a certain load is unavoidable. The nature of the detrital material is such that it is unstable when wet, the tendency toward instability depending on the fineness of the material and the clay content.

The normal load and nature of the material can not generally be changed, but it is usually possible to eliminate the third factor causing slides, namely, water. It is not necessary to eliminate all moisture, but the content must be kept below the critical point at which it makes the mass unstable.

This may be done, according to the nature of the problem, by surface protection from penetration by rainfall, by surface drainage, or by underground drainage which reaches the source of seepage or flow. Side fills and through fills can be protected from penetration by rainfall where necessary.

It is also possible to isolate them from underground water in most cases. Masses of overhanging detritus can generally be sufficiently drained to prevent movement.

Only sporadic attempts at drainage control have been made. A case at Morgantown, W. Va., has been described where drainage of underlying shale solved a serious problem.

Small-size open-joint tile has been occasionally used in soft spots in a road and French drains have been placed beneath inside ditches. Some surface drainage has been undertaken for the purpose of removing water from pockets of overhanging, old-slide detritus.

Such work, however, has been neither systematic nor thorough. Lack of emphasis on prevention is common to most human experience and we spend money on landslides largely after they have occurred.

It is believed that this district needs more trenching machines, and fewer steam shovels and piles; that drainage will be found to be cheaper and more permanent than any control method now employed, and that it must be undertaken with knowledge of local geological conditions.

Detrital areas, which are traversed by roads must be studied from a geological standpoint. Water seepage must be traced to its source, and water volume determined following rainfalls of varying intensity. Test holes or other means of interior exploration will answer this purpose.

If detrital material has been undisturbed for a considerable time, fine clay may have been washed downwards and accumulated below as in the formation

of subsoils. Therefore, where slide material has been at rest for some time, the greater part of the underground water will be found comparatively near the surface—that is within three to five feet of it.

In one case observed after a heavy rainfall, where a cut had been made in a thick mass of detritus, water was escaping in almost a solid sheet, along a plane about five feet below the top of the cut.

Before fills are placed it is vitally important to observe whether the location is on ground which is wet not only during but for some time after rains. When wet spots are found, the source of the moisture must be located.

Frequently it is in detritus on the hillside and after a fill is placed, water enters from the side or end contact. The use of wet materials in building a fill, especially at or near its base, has been demonstrated to be a dangerous practice.

A number of illustrations of sidehill failures are presented because they constitute the most serious phase of the slide problems in this district. Most of them can be prevented by drainage on the inside of the road, or, better, by drainage installed before the road is graded.

The annual damage resulting from the slides and subsidence is so enormous that systematic preventive experiments and study of relative costs and permanency of results is obviously justified.

It is believed that the solution of a very large proportion of the cases which arise, and this includes evidence of danger as well as slide movement, lies in the direction of drainage.

Improvement Made In Road Machinery For Removing Snow

IMPROVEMENT in road machinery has resulted in marked progression in removing snow from highways throughout the United States, the Bureau of Public Roads announced November 5.

The full text of the Bureau's statement follows:

In 36 states, where snowfall is heavy, 111,645 miles of main highways were cleared during the winter of 1927-28.

TRUCK PLOWS FAVORED

Ever since the practice of removing snow from highways began in 1921-1922, there has been a steady improvement in machines and equipment available, with an increased amount of equipment every year. In the six years, the use of truck plows has grown from 184 to 3412; the number of tractor plows from 281 to 1275. Since both types multiplied more than elevenfold, and since road mileage cleared increased only about fourfold, indications point to a greater completeness of snow removal. The use, during the past season, of less than half the number of graders employed in the previous year indicates that the grader has been found less effective than the truck and tractor plows.

In 17 of the states, all snow-removal work was done under the supervision of the state highway departments. In 15 states, the work was done by both states and counties or other local governments. In only four states was the work done solely under local control.

Suggest Zoning as Means of Preserving Beauty of Highway

(From the *Burlingame Advance*.)

The city of Burlingame faces a problem on the Bayshore Highway. The problem lies in the new road link's beautification and the keeping of unsightly buildings from its borders.

The State Highway Commission has petitioned Burlingame officials to preserve the road borders for lawns, shrubs and flowers.

And that brings the officials face to face with the problem. As the situation stands today, the lands adjacent to the Bayshore Highway are unrestricted. They are not even zoned. Owners of the lots can dispose of the land for any purpose, factories, residences, hot-dog stands or anything they choose. Burlingame has but one control over the land and that is through a fire ordinance. This jurisdiction, according to officials of the city is questionable.

City Treasurer Frank Bloom suggests a remedy. This remedy is in the form of a petition signed by many people so that it will bear weight with the council. This petition should request the council to immediately zone the lands immediately touching the highway as first class business property. This zoning will automatically bar cheap and unsightly structures.

Indications of what might be in store in the future is the fact that already a tract of land adjoining the shore road, is offered for industrial purposes.

One parcel of land has already been designated residential but not officially so. No ordinance can regulate the type of construction.

This is an important matter and citizens should act upon it immediately or a beautiful bit of road may rapidly become an avenue of advertising sign boards and unattractive cheap buildings for commercial gain.

An honest speeder had just hit a dog and had returned to settle his damages, if possible. He looked at the dog a moment and addressed the man with a gun.

"Looks as if I'd killed yer dog."

"Certainly looks that way."

"Very valuable dog?"

"Not very."

"Will five dollars be enough?"

"Well—I guess so."

"Sorry to have broken up your hunt," said the motorist pleasantly as he handed the owner a crisp five-dollar bill.

"I wasn't going hunting—jest going out in the woods to shoot the dog."—*Towney Kat*.

Work on the widening and straightening of the Mount Baker highway, Washington, probably will be started in the early spring. Preparations are being made by the state highway department to ease a number of dangerous curves and to build two new bridges over the Nooksack River, one at Nugent's Crossing and one at Warnick.

"Have you some of that gasoline that stops knocking?"

Service Station Attendant—"Yes."

"Then give my wife a glass."—*Los Angeles Azuride*.

Progress Reports From the Counties

ALPINE COUNTY

The survey for the new route between Markleeville and Coleville is progressing satisfactorily. Arrangements have been made to have the work in District IX handled by this District. Mr. W. B. Thompson is chief of party.

It is planned to build a new bridge and grade approaches across Markleeville Creek at Markleeville. The work will be advertised so that it may be done early next spring.

The widening of the Alpine Highway along the famous Carson Spur is nearing completion under the direction of Grant Merrill, Maintenance Foreman.

Widening of the present road at Kinneys Reservoir is well under way and is under the direction of Foreman Merrill.

Authority has been granted for surfacing and grading between Woodfords and Markleeville, and the work will start soon under Foreman Grant Merrill's supervision.

AMADOR COUNTY

Location survey on the Mother Lode Highway is being made under the direction of Chief of Party R. J. Munro, between Amador City and Martell.

The right of way is being secured for the construction of the new location between Drytown and Amador City. This is on the Mother Lode Highway.

Work has just started on the construction of drainage ditches and the placing of drain tile to adequately protect the oil surfacing between Sacramento County line and Central House, and also between Ione and Jackson by the maintenance forces under H. S. Clark.

The line change and improvement on the Silver Lake grade on the Alpine Highway between Kays Resort and Plasse's Turnout is nearing completion under the direction of Frank Walker, Maintenance Foreman.

The oil retreatment of oil surfaced gravel between the railroad crossing east of Ione and a point 2 miles easterly has just been completed by W. H. Martin, Maintenance Superintendent.

BUTTE COUNTY

A contract has been awarded to L. C. and W. E. Karsteadt to gravel surface, 20 feet by 6 inches, the highway between Butte Creek and Biggs road. This work is 90 per cent complete. At the same time, the floors of Butte Creek and Cherokee Canal bridges are being reconstructed in anticipation of heavier travel, which the improved road surface will encourage.

Harts Mill grade, between Oroville and Berry Creek, is being widened, and road drainage ditches are being built.

CALAVERAS COUNTY

Authority for construction of drainage ditches to adequately protect the oil surfacing has been granted, and work will start at once under the supervision of J. H. Gates, Maintenance Foreman.

Oil retreatment on certain sections of the oil surfaced gravel road between the San Joaquin County line and Valley Springs is about completed under the direction of W. H. Martin, Maintenance Superintendent.

Authority has just been granted for the clearing, grubbing, grading and drainage on the Black Springs line change. The clearing is about completed and the work of grubbing and grading will be rushed to completion under the supervision of Foreman Gates.

COLUSA COUNTY

Portions of the present highway from the westerly county limits to Mountain House are soon to be surfaced by gravel. This will permit of through yearly traffic from Williams to Clear Lake.

DEL NORTE COUNTY

The Holdener Construction Company, which has the contract for oiling and surfacing 35 miles of the Redwood Highway from the Oregon line southerly have practically completed the work, there being only a short stretch which it will be necessary to complete during next spring.

Protection work along portions of the road being surfaced by the Holdener Construction Company is in progress by the Bureau of Public Roads. Temporary exceptions have been made in the Holdener Construction Company work during the progress of the Bureau of Public Roads operations.

The contract on 21 miles of the Roosevelt Highway north of Crescent City for placing approximately 16,000 cubic yards of crushed rock surfacing has now been completed.

John R. Hill, who has the contract for grading and surfacing on the Roosevelt Highway from the Oregon line southerly .7 mile, is now placing surfacing, and should be completed in a short while.

The Webber Construction Company was recently awarded a contract for placing 5000 cubic yards of standard crushed rock surfacing on the newly completed state highway from Elk Valley to Smith River Bridge on the Redwood Highway, and this work has just recently been satisfactorily completed, and the new roadway will be ready for use as soon as the bridge is completed.

J. E. Johnson, contractor for the grading and surfacing of the highway between the Klamath River and 7 miles northerly, has not yet completed his grading operations, but is rushing his surfacing as fast as possible in order to get out as much surfacing as possible before high water in the Klamath River forces a shutdown of the work.

Mr. Johnson's contract for the grading and surfacing of 3.5 miles from the southerly Del Norte County line northerly was practically completed when the winter's storms came. The heavy storms caused considerable damage and many large slides, and will make the road practically impassable for a good share of the winter, and will necessitate the contractor removing the slides and repairing the damage before the finishing work can be completed.

EL DORADO COUNTY

A 24-foot graded roadway, between Eagle Falls and Meeks Bay, is being built under contract by G. D. Contoules. The sharp curves, narrow roadway, and steep grades, now existing, will be eliminated when this project is completed, which is expected to be toward the end of November of this year.

Daylighting of cuts and widening of roadway have been made at points along the road to permit of observation points from which travelers may enjoy the excellent scenic views along this highway.

FRESNO COUNTY

Concrete work on the substructure of the bridge over the San Joaquin River at Herndon is nearing comple-

tion and Contractor Carl H. Peterson is assembling steel for the superstructure.

Work is being started at once on oil-mixing the road from Coalinga to the Monterey County line on the Sierra-to-the-Sea Highway. This road has recently been widened and partially resurfaced by day labor.

A location party under S. A. Cobb is making a survey in the Kings River Canyon. This work is attracting a great deal of attention and hearty support from the San Joaquin Valley.

The survey party in the Kings River Canyon, under S. A. Cobb, was caught by the first heavy snow of the season and a relief party was necessary to bring them out. The survey will be continued next spring.

GLENN COUNTY

Widening of the present roadway between Logandale and Willows is under way by D. McDonald. The highway is open for traffic as the widening is all on the west side of the existing pavement. W. E. Shaw is the resident engineer on this work.

HUMBOLDT COUNTY

The Engelhart Paving and Construction Company have completed their contract for grading and surfacing the 6.8 miles southerly from the northerly Humboldt County line except for the placing of 3 inches of additional crushed rock surfacing over the roadway where reinforcement was necessary.

On that portion of the highway from Orick northerly to Russ Grove, bids were recently received for placing an additional 3 inches standard crushed rock surfacing over 6½ miles of the roadway. The Engelhart Paving and Construction Company were the low bidders on the work, and if the contract is awarded to them, it is expected that surfacing operations will start immediately.

W. H. Hauser has completed the construction of 2.1 miles of the Redwood Highway between Fortuna and Fernbridge except for the placing of approximately 600 cubic yards of crushed rock surfacing. The entire length of the contract is being used by the traveling public.

A line improvement at the southerly approach to the North Scotia bridge has been satisfactorily completed by Smith Brothers, and the road open to traffic.

Contractor W. C. Elsemore is placing additional crushed rock surfacing over 1.4 miles of the Redwood Highway in the vicinity of Pepperwood. His work is just a little more than half complete at the end of November.

INYO COUNTY

State forces have now completed oiling, or reoiling by the road-mix method all of the road on the main highway from the northerly county boundary to Independence, with the exception of portions previously improved or under contract. The oiling through the town of Independence and between there and Alabama Gate will be completed soon.

The grading of certain line changes on the road between Big Pine and Tinemaha Dam by state forces has been completed and the surfacing, oil-treated, has been recently completed by Montfort and Armstrong, between those points.

The Alabama Gate-Diaz Lake section, which includes the town of Lone Pine, under contract to the Southwest Paving Company, is now shaping up and a portion has been opened to traffic. The placing of the crushed rock base course is about completed and the placing of the top course is to start at once.

Work on the Olancha-Cottonwood Creek portion of the main highway, also under contract to the Southwest Paving Company, is just started; a ¾-yard gas shovel, trucks, etc., are at work on the grading and the timber bridges are under way.

A new reinforced concrete bridge across the city of Los Angeles aqueduct, near Cowan Station was recently opened to travel eliminating a rough stretch of the old road.

The district office at Bishop has been enlarged by the addition of two wings. One of these wings is

devoted entirely to a drafting room and blueprint room, and the other given over to offices. This is a much needed improvement and required by the expansion of the district organization.

The furnishing of surfacing for 3 miles south of Tinemaha Dam is advertised for bids to be received at the district office on November 9th.

The portion of road from Diaz Lake to Cottonwood Creek, being the 10 miles between the two Southwest Paving Company's contracts, is advertised for bids to be received on November 21st. This work covers the grading and surfacing (oil-treated) of this section of road to new alignment and grade and will eliminate one of the poorest sections of road between Mojave and Bishop, so far as alignment and grade are concerned.

KERN COUNTY

A crew has completed the survey from Mojave to Cinco on the main highway, obtaining information for the preparation of plans and advertising of this section of road this year. They are now working from a point 5 miles north of Ricardo to Freeman for the same purpose.

The new road graded by state forces from the main highway near Freeman to the Walker Pass Summit, is now completed. To those who have traveled the old winding one-way road, this newly graded section will be a pleasant surprise.

The contract for grading and paving Wasco to Famosa on Route 33 has been awarded to G. A. Graham. Construction work is now under way.

Kern County is financing a survey over the Tehachapi from Bakersfield to Mojave. This work will be put under way at once.

A survey over the Tehachapi from Bakersfield to Mojave has been started by a party under S. A. Cobb. This work is being financed by Kern County.

The Valley Paving Company of Visalia has started grading work on their contract from Famosa to Wasco on the Cholame Lateral.

KINGS COUNTY

The California Construction Company is starting work on widening and resurfacing from Hanford west to the county fair grounds. J. F. Knapp has charge for the state.

The 30-foot pavement from Hanford west on the Sierra-to-the-Sea lateral is nearing completion by the California Construction Company. J. F. Knapp is resident engineer on this work.

LAKE COUNTY

The state, using convict labor forces, is constructing a graded roadway between Lucerne and Abbott Mine. W. L. McFadden is the present resident engineer. January 1, 1929, is the estimated completion date.

Bids will be opened on November 21st of this year for grading and surfacing with oil treated crushed stone the highway between Lucerne and Clear Lake Oaks. It is expected that the work will extend over 11 months.

LOS ANGELES COUNTY

Work has been completed by the Lewis Construction Company on the grading of 1.5 miles between Arroyo Sequit and Los Alisos Creek on the Malibu Ranch. Premixed California type surfacing was placed by the contractor.

A contract has been let for the reconstruction of about seven-tenths mile of highway between the northerly city limits of Los Angeles and Newhall Tunnel. The roadway, which will be constructed along a revised alignment, will be 40 feet wide, paved with 24 feet of bituminous macadam.

Grading and the placing of culverts are in progress on the reconstruction of 1.4 miles of Foothill boulevard between Glendora and La Verne.

MADERA COUNTY

Hanrahan Company are setting up an asphalt plant at Berenda for the resurfacing of Route 4 from Madera to Berenda. Paul L. Wilcox is resident engineer for the state.

A contract for building bridges over Ash and Berenda sloughs on the Pacheco Pass Highway has been awarded to A. W. Kitchen of San Francisco.

Contractor A. W. Kitchen of San Francisco has started work on bridges over Ash and Berenda sloughs on the Pacheco Pass Highway. Foundation work is well under way and it is expected to have the bridges finished ahead of the spring floods.

Grading work on Hanrahan Company's contract from Madera north is being rushed and paving will start at once.

The contract for grading, bridge approaches and paving between Herndon and Tharsa, to connect with the new bridge over the San Joaquin River has been awarded to the Hanrahan Company of San Francisco.

MARIPOSA COUNTY

Basich Bros. of Los Angeles, who have the contract for grading and rock surfacing a portion of the Yosemite all-year-highway are making rapid progress on structures and grading work. W. T. Rhodes is resident engineer for the state on this job.

The convict camp near Mariposa has been discontinued and the work is being carried on by day labor under Superintendent Carl Nelson. Some important revisions of line have been built and surfaced and very satisfactory progress is being made.

All of the Yosemite Highway is in excellent shape for the winter traffic.

MERCED COUNTY

The bridge over the San Joaquin River near Los Banos on the Pacheco Pass Highway is being repainted and redecked by Stephenson Construction Company of San Francisco. New approaches are also being built. This work will be completed by November 30th.

MONO COUNTY

The contract for grading about 3 miles of the main highway near Bridgeport, which work was under contract to Coolidge and Scott, of Nevada, is completed and will afford a much better road for the winter travel.

State forces have been working with very satisfactory results widening certain of the narrowest portions of the Tioga Grade. This work will continue until weather conditions interfere which may be rather soon, as four inches of snow recently fell near the summit.

The Sonora Pass road has also been greatly improved this summer by state forces; a compressor and jack hammers, together with the judicious use of powder has removed many of the rocky points heretofore dreaded by the automobile tourist.

The surveys are now complete on the main highway above Bridgeport and down the Walker River to Coleville.

Many favorable comments on the oiled surface on the Sherwin Hill grade have been received and many a car now goes over "in high" that never could brag of that accomplishment before.

Bids will be received on 1.6 miles of grading to new alignment, at Hilton Creek in Long Valley, on November 21st.

NEVADA COUNTY

Between Indian Springs and Soda Springs a graded roadway is being built, under contract, by The Callahan Construction Co., Inc. This is a particularly

heavy piece of grading work, involving 200,000 cubic yards of earthwork, or at a rate of 20,000 cubic yards per mile. The work is now 20 per cent complete, and is expected to be completed by August of next year. A. R. McEwen is resident engineer.

The highway between Donner Lake and Truckee is being regraded and resurfaced, under contract, by Mathews Construction Company.

ORANGE COUNTY

The grading and paving, with California type surfacing, of the approaches to the Galivan overhead crossing of the Santa Fe Railway tracks have been completed. Traffic is using the new stretch of highway, which has eliminated the dangerous grade crossing at Galivan.

All grading work has been completed and paving is in progress on the reconstruction of the state highway between Anaheim and Fullerton. The new pavement will be of Portland cement concrete 56 feet wide between curbs.

A contract has been let and work is in progress on the grading and paving of 0.2 mile of highway on improved alignment, on the coast highway just west of San Clemente.

PLACER COUNTY

Between Andora subway and Lincoln, the highway is being reconstructed. This work was recently let by contract to Fredrickson & Watson Construction Co. and Fredrickson Bros.

The work will consist of revision of alignment and grade, utilization of that part of the present 20-foot pavement that is of sound construction, constructing new pavement over the existing 15-foot pavement, and, where regrading and realignment is necessary. The final construction will be a 20-foot continuous pavement with a 36-foot over all roadbed. J. D. Greene is resident engineer on this work.

From Sheridan to the northerly boundary of Placer County, E. F. Hilliard is constructing, by contract, a bituminous macadam surfacing over the existing concrete pavement and newly placed and existing rock borders.

This will result in a 20-foot bituminous macadam surface pavement with a 26-foot over all roadbed.

SACRAMENTO COUNTY

A reconstruction project is under way between North Sacramento and Del Paso Park. The work consists of realignment, revised grade, widening and thickening of present pavement. The wearing surface will be asphaltic concrete. The contractor, Clark and Henery Construction Co., is comfortably ahead of the construction schedule, and is expected to finish much sooner than the completion date, January 4, 1929. C. W. Rust is resident engineer on this work.

Enclosed are two photo views of the Ord Spreading & Raking Machine used on this work.

Good progress is being made on the grading and subgrade for the concrete paving to go between Galt and Arno, Fredrickson Bros. and Fredrickson & Watson Construction Company, contractors. C. M. Butts is the resident engineer.

The oil treatment of the crushed gravel surfacing between 1 mile south of Arno and 1 mile north of Arno has been completed and is now open to traffic. The work was done under the direction of W. H. Martin, Maintenance Superintendent.

Authority has been granted for the repair, creosoting and painting of the timber section of the Rio Vista Bridge. Materials are now on hand and work is starting under the direction of G. E. Marshall, Maintenance Foreman.

SAN DIEGO COUNTY

Good progress is being made by the Hauser Construction Company on the reconstruction of 7.2 miles

of the San Diego to El Centro highway between Viejas Creek and Guatay Creek. Four steam shovels are at work grading the 36-foot roadbed.

Easterly from the Hauser Construction Company's job, between Guatay Creek and Pine Valley, the Nevada Contracting Company has work under way on the improvement of the alignment and widening of the roadbed to 36 feet.

SAN JOAQUIN COUNTY

The concrete paving job between Mossdale and French Camp is practically complete. Fredrickson Bros. and Fredrickson & Watson Construction Company are the contractors. C. M. Butts is resident engineer.

Widening with earth of the grade of the Cherokee Lane for about 5 miles between Cherokee Lane and Live Oak on the route between Stockton and Lodi is nearly complete. D. McDonald is the contractor, under the direction of R. H. Lapp, resident engineer.

Splendid progress is being made by contractors Gannon and McCarty on raising the grade north of the Stockton Diverting Canal. This is on the new entrance to Stockton from the north. Mr. Hubbard is acting resident engineer.

The work of surfacing the Mokelumne River bridge with rock and asphalt has been completed under the supervision of W. H. Martin, Maintenance Superintendent.

Two "Slow" signs have been erected at the reverse curve on the Hogan Road, and a service agreement has been issued to cover their wiring and proper illumination. Superintendent Martin is directing this work.

Oil retreatment of certain sections of the oiled surfacing between a point 1.3 miles east of Clements and the Calaveras County line is nearing completion under the supervision of Superintendent Martin.

SOLANO COUNTY

The contract under Larsen Bros. for grading and surfacing the line change back of Cordelia is progressing satisfactorily. This is on the main route between the Sacramento Valley and the Carquinez Bridge, also to Napa and the Redwood Highway. J. W. Cole is resident engineer.

Bids will be opened on October 17th for widening grade and oil mix borders for the piece of road between Fairfield and 5 miles north.

STANISLAUS COUNTY

Contractor C. W. Wood has finished the new south approach to the Stanislaus River Bridge, near Ripon and between Manteca and Modesto.

SUTTER COUNTY

From the end of pavement, south of Sutter City, to the end of pavement at Tarke, an asphalt seal on 1 inch of new surfacing has been applied to the highway.

TULARE COUNTY

The Valley Paving and Construction Company are making a high early average on their paving contract from Goshen Junction to Tulare. H. B. La Forge is resident engineer for the state on this job.

Paving between Tulare and Goshen, on the Golden State Highway, is being rushed to completion by the Valley Paving Company of Visalia, who have the contract for the work.

TUOLUMNE COUNTY

The premixed oil surface placed on about 9 miles of highway between Keystone and Jamestown on the Sonora lateral has been completed. A very fine looking job and pleasing riding surface has been obtained. Mankel and Staring are the contractors. A. K. Nulty is resident engineer.

Day labor forces under Superintendent S. E. Harris have been busily engaged in improving the famous Sonora Pass Road between the first and second crossings of Deadman's Creek. Work has been progressing rapidly. Most of the excavation has been in solid granite. Due to the early snow storm of recent date this work will be held up through the winter, contemplating an early completion in the spring.

The construction and repairs to maintenance camp at Baker's Station is about 75% completed and will be held up through the winter and completed in the spring. This work is under the supervision of Superintendent S. E. Harris.

Authority has been granted for the extension of the culverts between the Stanislaus County line and Jamestown. Materials have been ordered shipped and it is expected the placing of these culverts will start upon delivery. The work will be supervised by L. T. Robinson and L. P. Laird, maintenance foremen.

VENTURA COUNTY

Along the new coast highway southeasterly from Oxnard, side forms are being placed and subgrade prepared for the Portland cement concrete pavement. The job, which includes 11.6 miles of 20-foot concrete pavement with rock borders, 170,000 cubic yards of excavation, drainage structures, etc., is being done by Jahn & Bressi, contractors.

YOLO COUNTY

The new guard rail on the timber portion of the Yolo Causeway is nearing completion. P. F. Bender is the contractor. H. S. Marshall is the resident engineer.

Bids were opened October 10th for widening grade and placing premixed oil shoulders and surfacing for about 1 mile west of the Yolo Causeway. The contract was awarded to the low bidder, the firm of Fredrickson Bros. and Fredrickson and Watson Construction Company.

The work of oil mixing the rock borders between the M Street Subway and a point 2 miles west has been practically completed under the direction of W. H. Martin, maintenance superintendent.

PERSONNEL

Mr. C. J. Temby, who has been associated with the California Highway Commission for about 14 years, and who has been serving as office engineer for the past 2 years, is being transferred to Central Office, Department of Surveys and Plans. District X wishes him well.

Mr. B. W. Booker, who has served the state for about 7 years with this department, is being transferred to District X from District I. Mr. Booker has been appointed office engineer of District X, and District X hopes that he will enjoy his work in the new position.

Mr. Bert A. Reber, formerly associated with Districts III and X, but who for the past 14 months has been with the Alleghany-El Dorado Gold Mining Company, is now back with District X.

LOUISIANA—The state highway department spent \$254,000 to help fight the Mississippi Flood in 1927, and \$529,000 to repair or rebuild highways and bridges.

California's Rank Among States In Auto Fee Costs

Figures showing the ranking of the various states of the Union in total motor vehicle, license and gas revenue per vehicle for 1927 appear in the October number of *American Highways*.

Here is California's 1927 rank, among the states:

First—In revenue from gasoline tax (\$22,467,083).

Second—In automobile and truck registration (1,693,195).

Thirteenth—In gross receipts from auto license fees (\$8,796,348).

Twenty-fifth—In average gas receipts per motor vehicle (\$13.62).

Forty-fourth—In average motor and gas receipts per motor vehicle (\$18.81).

Forty-eighth—In average motor license per vehicle (\$5.19).

Record of Bids and Awards

CONTRA COSTA COUNTY—Between Richmond and San Pablo Creek, about 1.3 miles in length to be graded and paved with asphalt concrete. Dist. IV, Rt. 14, Sec. A. Engr's Est. \$66,858.25. Warren Construction Company, Oakland, \$49,544.10; California Construction Co., San Francisco, \$57,608.60. Contract awarded to Warren Const. Co.

DEL NORTE COUNTY—Between Elk Valley Road and Smith River, furnishing and spreading crushed stone surfacing 3.64 miles long. Dist. I, Rt. 1, Sec. C. Engr's Est. \$14,500. Webber Construction Co., Crescent City, \$12,750; Holdener Construction Co., Inc., Sacramento, \$14,500; Engelhart Paving and Construction Co., Eureka, \$18,000; Parker Schram Co., Portland, Ore., \$13,150; E. B. Bishop, Sacramento, \$14,250. Contract awarded to Webber Construction Co.

FRESNO—MADERA COUNTIES—Const. 20-foot Portland cement concrete pavement from Herndon to Tharsa, length 1.82 miles. Dist. VI, Rt. 4, Sec. C-A. Engr's Est. \$120,691.50. Fredrickson & Watson Construction Co., Oakland, \$92,986.50; C. W. Wood, Stockton, \$87,689; Force-Currihan & McLeod, Oakland, \$92,291.50; John Jurkovich, Fresno, \$92,066; A. J. Grier, Oakland, \$89,182; Hanrahan Company, San Francisco, \$83,709.20; N. M. Ball, Porterville, \$84,611.50. Contract awarded to Hanrahan Company.

IMPERIAL COUNTY—Between 0.7 mile S. Kane Sprs. and Arroyo Salada Wash, 13.5 miles grading and asphalt concrete surfacing. Dist. VIII, Rt. 26, Sec. B-C-D. Engr's Est. \$274,904.50. Charles U. Heuser, Glendale, \$290,008; Force-Currihan & McLeod, Oakland, \$305,202; V. R. Dennis Const. Co., San Diego, \$284,502; Steele Finley, Santa Ana, \$229,258; Griffith Co., Los Angeles, \$315,623; R. E. Hazard Contracting Co., San Diego, \$217,814.50; Southwest Paving Co., Los Angeles, \$266,685; A. Teichert & Son, Inc., Sacramento, \$283,273; Geo. R. Curtis Paving Co., Los Angeles, \$254,185. Contract awarded to R. E. Hazard Construction Co.

KINGS COUNTY—Between the County Fair Grounds and Hanford, about 0.7 miles in length, to be graded and surfaced with asphalt concrete. Dist. VI, Rt. 10,

Sec. C. Engr's Est. \$23,937.80. California Const. Co., San Francisco, \$25,536.88. Contract awarded to California Const. Co.

LAKE AND COLUSA COUNTIES—Between Abbott Mine and Mountain House (Venado), loading, hauling and spreading of bit run gravel and broken stone. Dist. III, Rt. 15, Sec. C-C & D. Engr's Est. \$5,277. E. B. Bishop, Sacramento, \$5,950; Albert G. Raisch, San Francisco, \$6,204.40; Hemstreet & Bell, Marysville, \$5,828. Contract awarded to Hemstreet & Bell.

LOS ANGELES COUNTY—Between northerly city limits and Los Angeles and Newhall Tunnel, about 0.7 miles in length to be graded and surfaced with bituminous macadam. Dist. VII, Rt. 4, Sec. E. Engr's Est. \$34,156.25. Geo. Mitchell Co., Huntington Park, \$42,878.50; George R. Curtis Paving Co., Los Angeles, \$63,238; A. J. Grier, Oakland, \$43,739.60; Nighbert & Carnahan Co., Bakersfield, \$47,806.50. Contract awarded to Geo. Mitchell Co.

MADERA COUNTY—Across Ash Creek about 9 miles west of Califa, a timber bridge consisting of thirty-nine 19-foot spans on pile bents. Across Berenda Slough about 3½ miles west of Califa, a timber bridge consisting of twenty-two 19-foot spans on frame bents with conc. pedestals. Dist. VI, Rt. 32, Sec. A. Engr's Est. \$55,927. Ben C. Gerwick, Inc., San Francisco, \$55,016; Fredrickson & Watson Construction Co., Oakland, \$54,303.40; George J. Ulrich Const. Co., Modesto, \$56,387.75; Stephenson Const. Co., San Francisco, \$53,342.95; Lambert & Wood, Fresno, \$60,780.70; E. K. Angle, Dos Palos, \$65,043.15; John P. Williams, Fresno, \$68,645.50; Butte Const. Co., San Francisco, \$52,365.40; A. W. Kitchen, San Francisco, \$51,422.73; Otto Parlier, Tulare, \$52,997; Paul M. White, Santa Monica, \$55,824. Contract awarded to A. W. Kitchen.

MARIN COUNTY—From San Rafael to San Quentin, 3.01 miles of 20-foot and 40-foot bituminous macadam pavement. Dist. IV, Route 1-69, Section C-A. Engr's Est. \$139,569.25. Dutton-Dredge Company, San Francisco, \$146,514; J. P. Holland, Inc., San Francisco, \$118,341.50; J. V. Galbraith, Petaluma, \$152,588.55; George Pollock Company, Sacramento, \$156,069; Jack Casson, Hayward, \$122,281.50; C. T. Malcolm, Walnut Creek, \$149,415; J. F. Collins, Stockton, \$136,698.50; Mathews Construction Company, Sacramento, \$158,718; Force, Currihan & McLeod, Oakland, \$132,896.50; Von der Hellen Pierson and Logan, Medford, \$136,041.50; Allied Contractors, Inc., Omaha, \$119,576.50; A. J. & J. L. Fairbanks, Inc., So. San Francisco, \$151,712.75; Granfield, Farrar and Carlin, San Francisco, \$103,827.50; Ariss Knapp Co., Oakland, \$140,699.50. Contract awarded to Granfield, Farrar and Carlin.

MODOC COUNTY—Bridge across Ash Creek, three 43-foot girder spans, bridge across Dry Creek double 6-foot by 8-foot conc. box culv., bridge across Butte Creek, two 24-foot girder spans. Dist. II, Rt. 28, Sec. A. Engr's Est. \$50,205. Coolidge & Scott, Adin, \$53,717; J. P. Brennan, Redding, \$49,604.84; Dunn & Baker, Klamath Falls, Oregon, \$51,144; Butte Const. Co., San Francisco, \$75,336.50. Contract awarded to J. P. Brennan.

MONTEREY COUNTY—2½ miles south of Greenfield, about 1.1 miles in length to be graded and portions surfaced with waterbound macadam base, Type "B." Dist. V, Rt. 2, Sec. E. Engr's Est. \$22,852.50. Tiffany, McReynolds, Tiffany, San Jose, \$20,501.50; W. A. Dontanville, Salinas, \$19,587; Granite Construction Co., Watsonville, \$16,021. Contract awarded to Granite Construction Co.

MONTEREY COUNTY—3.3 miles south of San Lucas, about 0.4 miles to be graded and surfaced with waterbound macadam base, Type "B." Dist. V, Rt. 2, Sec. 6. Engr's Est. \$9,823. W. A. Dontanville, Salinas, \$8,342; Chas. W. Wimmer, Santa Barbara, \$10,028; Granite Const. Co., Watsonville, \$8,374. Contract awarded to W. A. Dontanville.

ORANGE COUNTY—West of San Clemente 0.2 miles grading and P. C. concrete pavement. Dist. VII, Rt. 2, Sec. A. Engr's Est. \$9,485. Steele Finley, Santa Ana, \$7,267.20; H. E. Cox & Son, Pasadena, \$10,864; Gritton & Stephenson, Santa Ana, \$9,538.05. Contract awarded to Steele Finley.

ORANGE COUNTY—A reinforced concrete and steel girder overhead crossing over tracks at A. T. & S. F. Ry. at Irvine. Dist. VII, Rt. 2, Sec. B. Engr's Est. \$71,295. John Simpson & Co., Los Angeles, \$58,109; De Waard & Son, San Diego, \$64,286; Mittry Bros. Const. Company, Los Angeles, \$65,915; Fredrickson & Watson Const. Company, Oakland, \$67,185; McWilliams & Ritchey, Los Angeles, \$67,154; Butte Const. Company, San Francisco, \$70,640; Linderman & Dueker, Inc., Harbor City, \$475,235.90; Oberg Bros., Los Angeles, \$68,130.60; Charles & F. W. Steffgen, San Diego, \$76,466; Byerts & Dunn, Los Angeles, \$61,916; Martin Green, San Bernardino, \$77,833; Wil-

Iiam J. Shirley, Los Angeles, \$78,880; Whipple Engineering Co., Monrovia, \$61,990; E. S. Johnson, Pasadena, \$72,715; A. V. Perkinson, Inc., Los Angeles, \$60,792.60. Contract awarded to John Simpson & Company.

ORANGE-SAN DIEGO COUNTIES—A reinforced concrete girder bridge across Prima Deshecha Canada. A reinforced arch culvert across Segunda Deshecha Canada. A reinforced concrete girder bridge across Las Encinas Creek. Dist. VII, Rt. 2, Sec. A-B. Engr's Est. \$36,347.20; Linderman & Dueker, Inc., Harbor City, \$44,201.23; Ross Const. Company, Los Angeles, \$44,852; Oberg Bros., Los Angeles, \$32,340.25; Byerts & Dunn, Los Angeles, \$43,031.50; De Waard & Son, San Diego, \$42,772; Paul M. White, Santa Monica, \$34,411.80. Contract awarded to Oberg Brothers.

PLACER COUNTY—From Roseville to Rocklin about 2.9 miles to be graded and surfaced. Dist. III, Rt. 17, Sec. A. Engr's Est. \$58,042; W. J. Taylor, Palo Alto, \$58,974; J. E. Johnston, Stockton, \$47,092; J. V. Galbraith, Petaluma, \$48,113.03; C. W. Wood, Stockton, \$52,466.50; Pacific States Const. Co., San Francisco, \$54,020.30; E. B. Skeels, Roseville, \$52,026.55; Fredrickson & Watson Const. Company, Fredrickson Bros., Oakland, \$64,351.80. Contract awarded to J. E. Johnston.

PLACER COUNTY—Between Andora Subway and Lincoln 7.6 miles grading and 7.6 miles grad. & P. C. Pav. Dist. III, Rt. 3, Sec. A. Engr's Est. \$78,288.50; W. J. Taylor, Palo Alto, \$72,707; C. W. Wood, Stockton, \$63,638; E. B. Skeels, Roseville, \$71,594.50; J. V. Galbraith, Petaluma, \$68,037.90; Fredrickson & Watson Const. Co. & Fredrickson Bros., Stockton, \$60,560.90. Contract awarded to Fredrickson & Watson Const. Co. & Fredrickson Bros.

PLACER COUNTY—Overhead crossing of Southern Pacific Railroad near Magra. Dist. III, Rt. 37, Sec. C. Engr's Est. \$14,465; Geo. J. Ulrich Construction Co., Modesto, \$14,867.50; Butte Construction Co., San Francisco, \$16,933.95; C. C. Gildersleeve, Felton, \$14,997; Mathews Construction Co., Sacramento, \$19,520; C. A. Bruce & Sons, Pleasanton, \$17,689; Edgar Noble, Marysville, \$15,137.45; E. B. Skeels, Roseville, \$17,435. Contract awarded to Geo. J. Ulrich Const. Company.

SAN BERNARDINO COUNTY—Between Daggett and 4 miles east of Hector 21.3 miles grading 8 C oil treated crushed gravel or stone surfacing. Dist. VIII, Rt. 58, Sec. F-G. Engr's Est. \$297,672.90; Dillon & Boles, Los Angeles, \$264,235; E. J. Davis, Venice, \$299,666.10; Ken. Hodgman, San Marino, \$321,420.80; J. C. Compton, McMinville, Oregon, \$332,364.80; J. W. Breedlove, Corp., Los Angeles, \$310,762; George R. Curtis Paving Co., Los Angeles, \$349,302.80. Contract awarded to Dillon & Boles.

SAN BERNARDINO COUNTY—Between Needles and Topoc. 5.4 miles grading. Dist. VIII, Rt. 58, Sec. P. Engr's Est. \$38,970; James W. Martin, Los Angeles, \$39,952.90; Charles U. Heuser, Glendale, \$28,752.20; Bert Calvert, Los Angeles, \$25,975.30; Martin Green, San Bernardino, \$29,842.90; Steele Finlay, Santa Ana, \$34,375.30; L. G. Singletary, Riverside, \$36,424.20; Greemore Bros., Bakersfield, \$53,459.90; Roy Skousen, San Bernardino, \$29,124.10; Triangle Rock & Gravel Company, San Bernardino, \$32,495.70; Jones & Stacey, Mineral, \$45,146.40. Contract awarded to Bert Calvert.

SAN BERNARDINO COUNTY—From $1\frac{1}{2}$ miles N. E. of Yermo to $1\frac{1}{2}$ miles S. W. of Dunn 20.78 miles of oil treated crushed gravel 20 feet wide. Dist. VIII, Rt. 31, Sec. H-J. Engr's Est. \$302,015.40; E. J. Davis, Venice, \$254,161.65; J. J. Hales, Santa Ana, \$247,715.50; Dillon & Boles, Los Angeles, \$237,696.26; Fred W. Nighbert, Bakersfield, \$255,333.40; Dunn & Baker, Klamath Falls, \$307,597.90; Isbell Const. Company, Fresno, \$279,544; Steele Finlay, Santa Ana, \$245,487.40; Porce-Curriegan & McLeod, Oakland, \$274,613; Watson & Sutton, San Diego, \$272,591.70; Allied Contractors, Inc., Omaha, \$250,696.90; G. E. Flnnell and Holdener Construction Co., Sacramento, \$288,291.60. Contract awarded to Dillon & Boles.

SAN DIEGO COUNTY—Between Pine Valley and Kitchen Creek about 7.2 miles to be graded and paved with P. C. C. Dist. VII, Rt. 12, Sec. D, E & F. Engr's Est. \$276,252.50; Nelson and Sloan, Chula Vista, \$295,069; Wells & Bressler, Santa Ana, \$330,207; Watson & Sutton, San Diego, \$290,090.50; Basich Brothers Construction Company, Los Angeles, \$259,099.50; Jahn and Bressi Construction Co., Inc., Los Angeles, \$303,635.50; George Herz & Company, San Bernardino, \$276,164. Contract awarded to Basich Brothers Construction Company.

SAN DIEGO COUNTY—Between Guatay Cr. and Pine Valley. About 3.9 miles in length to be graded. Dist. VII, Rt. 12, Sec. D. Engr's Est. \$91,251. Lewis

Construction Company, Santa Monica, \$106,308; Nelson & Sloan, Chula Vista, \$131,925.50; J. G. Donovan & Sons, Los Angeles, \$132,903.25; J. W. Breedlove Corp., Los Angeles, \$109,022; Hauser Construction Company, Long Beach, \$124,537; Nevada Construction Company, Fallon, Nevada, \$99,804; Isbell Construction Company, Carson City, Nevada, \$147,028; Pioneer Transfer Company, Inc., Calexico, \$123,346; Watson & Sutton, San Diego, \$136,758.50; Robinson Roberts Company, Los Angeles, \$99,915.50. Contract awarded to Nevada Construction Company.

SAN LUIS OBISPO COUNTY—Two timber bridges across Arroyo de La Cruz, fourteen 19-foot spans and San Carpojo Cr., nine 19-foot spans. Dist. V, Rt. 56, Sec. A. Engr's Est. \$31,301.25; C. C. Gildersleeve, Felton, \$28,253.75; Theo. M. Maino, San Luis Obispo, \$28,448.19; Chas. & F. W. Steffen, San Diego, \$25,205.65; Paul M. White, Santa Monica, \$25,983.50. Contract awarded to Chas. & F. W. Steffen.

SAN LUIS OBISPO COUNTY—Between 1.7 miles west of Shandon and the easterly boundary, about 15.4 miles in length, to be graded and paved with bituminous macadam. Dist. V, Rt. 33, Sec. B-C. Engr's Est. \$174,639; Holdener Const. Company, Sacramento, \$153,016; Granite Construction Co., Watsonville, \$174,330.38; A. Teichert & Son, Inc., Sacramento, \$150,808; Malcolm & Taylor, Walnut Creek, \$202,727. Contract awarded to A. Teichert & Son, Inc.

SHASTA COUNTY—Repair bridge across Sacramento River 1.0 miles east of Redding. Consisting one 320-foot st. truss span, one 180-foot st. truss span, one 60-foot st. truss span, one 40-foot st. truss span and 787 feet of timber trestle. Dist. II, Rt. 28, Sec. A. Engr's Est. \$32,505.50; J. P. Brennan, Redding, \$29,619.90; M. B. McGowan, San Francisco, \$34,934; Holdener Construction Company, Inc., Sacramento, \$36,460; McDonald & Maggiora, Sausalito, \$48,153.33; Fred J. Maurer & Son, Inc., Eureka, \$33,208; Parker-Schram Company, Portland, \$40,805; The Duncan-Harrelson Co., San Francisco, \$38,176; Portland Bridge Company, Portland, \$35,300; M. A. Jenkins, Sacramento, \$31,670; R. B. McKenzie, Gerber, \$29,610; N. R. Nicolsen, San Jose, \$34,336. Contract awarded to M. B. McGowan, San Francisco.

SOLANO COUNTY—Between Fairfield and Nelsons Corner, about 5 miles in length to be graded and surfaced. Dist. X, Rt. 7, Sec. C. Engr's Est. \$38,001.50; C. W. Malcolm, Walnut Creek, \$42,301.10; Lord & Bishop, Oroville, \$47,485.50; J. R. Reeves, Sacramento, \$40,610.85; J. V. Galbraith, Petaluma, \$43,093.50; Larsen Bros., Sonoma, \$44,713.50; J. E. Johnston, Stockton, \$35,453.30; Mankel & Storing, Sacramento, \$35,178; C. W. Wood, Stockton, \$40,204.50. Contract awarded to Mankel & Storing.

TUOLUMNE COUNTY—Reinforced concrete girder bridge across Sullivan Creek 2 miles east of Sonora, and 50-foot and two 30-foot spans on concrete bents and abutments with wing walls. Dist. X, Rt. 13, Sec. C. Engr's Est. \$19,308.60; C. C. Gildersleeve, Felton, \$23,276; Paul M. White, Santa Monica, \$24,718; George J. Ulrich Construction Company, Modesto, \$19,682; C. A. Bruce & Sons, Pleasanton, \$21,847; Fredrickson & Watson Const. Company, Inc. & Fredrickson Bros., Stockton, \$20,924; The Adams Co., Angels Camp, \$18,228.50. Contract awarded to The Adams Company.

VENTURA-LOS ANGELES COUNTIES—Between Little Sycamore Canyon and Solstice Canyon, about 11.5 miles in length to be paved with Portland cement concrete and bituminous macadam. Dist. VII, Rt. 60, Sec. A. Engr's Est. \$416,098.50; J. F. Knapp, Stockton, \$402,205; Jahn and Bressi Construction Co., Inc., Los Angeles, \$393,405; George R. Curtis Paving Company, Los Angeles, \$367,525.25; Wells & Bressler, Santa Ana, \$419,296.25; Ed. Johnson & Sons, Los Angeles, \$379,630.75; Basich Brothers Construction Company, Los Angeles, \$371,665; Matich Bros., Elsinore, \$358,861.25; Sander Pearson, Santa Monica, \$354,454.50; Sam Hunter, Santa Barbara, \$358,842.50; Geo. H. Oswald, Los Angeles, \$377,902.50. Contract awarded to Sander Pearson.

YOLO COUNTY—Between $1\frac{1}{2}$ miles west Yolo Causeway to Yolo Causeway 7.2 miles grading and portions surfaced with oil treated crushed gravel or stone. Dist. X, Rt. 6, Sec. A. Engr's Est. \$31,984.50; A. Teichert & Son, Inc., Sacramento, \$29,761; C. W. Wood, Stockton, \$32,212.50; Isbell Construction Company, Carson City, \$35,493; J. V. Galbraith, Petaluma, \$35,129.75; C. T. Malcom, Walnut Creek, \$30,332.25; Mankel & Storing, Sacramento, \$30,779; D. McDonald, Sacramento, \$29,375.25; A. F. Giddings, Sacramento, \$33,917.65; J. R. Reeves, Sacramento, \$34,585.50; Fredrickson & Watson Construction Company and Fredrickson Brothers, Stockton, \$25,394.05. Contract awarded to Fredrickson & Watson Construction Company and Fredrickson Brothers.

STATE HIGHWAYS IN CALIFORNIA SHOWING THE PRIMARY AND SECOND-ARY ROAD SYSTEMS AND THE DIVISION OF THE STATE UNDER THE BREED BILL.



CALIFORNIA HIGHWAYS and PUBLIC WORKS

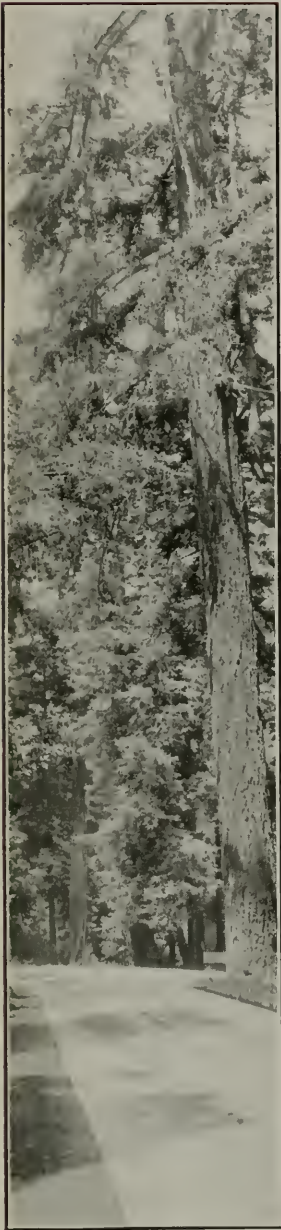


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Two Highway Budgets---The Governor's Budget and That Of the Highway Commission

By RALPH W. BULL, Chairman, California Highway Commission

THE STATE OF CALIFORNIA will disburse \$106,432,790 for highway purposes in the two fiscal years extending from July 1, 1929, to June 30, 1931.

This is shown in the budget submitted by Governor C. C. Young to the Legislature. Incidentally this budget discloses the fact that there are two highway budgets in California. One budget is that of the California Highway Commission. It totals \$60,773,490. This budget comprises the biennial program of new construction and reconstruction projects and estimated maintenance expenditures on the state highway system. It comprises a part, but only a part of the Governor's highway budget.

The Governor's budget, on the other hand, in addition to expenditures outlined in the program of the California Highway Commission contains also disbursements of highway money for a number of other purposes. These include the apportionment to the counties of their share of the 2-cent gasoline tax, estimated at \$31,606,745 for the 1929-1931 biennium; payments out of the State's general fund of \$9,110,425 for interest on and redemption of state highway bonds; expenditures of the Division of Motor Vehicle totaling \$3,169,030 paid out of automobile registration fees; payment of county traffic officers in the sum of \$1,742,500 which is deducted from the counties' share of the 2-cent gasoline tax. The expenses of the Division of Contracts and Rights of Way, which works in conjunction with the Division of Highways, at a cost for the biennium of \$30,600. All of these items with the \$60,773,490 budget of the California High-

way Commission make a grand total in the Governor's budget of \$106,432,790.

It is interesting to note that the peak of payments for interest and redemption of state highway bonds has apparently been passed. Thus the amount paid from the general funds of the state for these items will be \$332,640 less during the 1929-1931 biennium than was paid during the 1927-1929 biennium.

The statement that accompanies Governor Young's budget reveals some interesting facts relative to the disbursement of highway funds.

Attention is called by Governor Young to the fact that "the highways of California now receive the largest portion of the state's funds, when state aided county roads are included. Highway expenditures at the present time amount to 44 per cent of the total budget. California spends vast sums upon her highways and does so at the dictum of her people who appreciate fully the value of good roads in the development of the state."

Governor Young also emphasizes the huge saving in highway cost made possible through the adoption of a pay-as-you-go plan as compared with the issuance of bonds. He states that the cost of new highway construction projects recommended by the California Highway Commission for construction in the 1929-1931 biennium totals \$27,400,000. If this were paid from the proceeds of 4½ per

cent bonds, maturing in forty years the cost of the same projects would be \$51,272,250. Commenting on this, Governor Young says: "The wisdom of the legislature in proposing and enacting a tax on gasoline, which all users of



RALPH W. BULL.

State Highways in the Country Back of the Sierras



A Mono County view.

~ ~



In Inyo County between Lone Pine and Independence.

~ ~



A highway running into the clouds—between Alabama Gate and Manzanar, Inyo County.

~ ~



View of the mountains looking west in Inyo County.

Highway Development in Inyo County

By F. G. SOMNER, District Engineer

THE CONCLUSION in January, 1928, of contracts by the Southwest Paving Company, Diaz Lake to Alabama Gate, and by Montfort and Armstrong, between Tinemaha and Big Pine, marks the completion of an important link in highway development "east of the high Sierras;" i. e. the construction of an oiled surfaced road from Diaz Lake south of Lone Pine to Sherwin Hill at the head of Owens Valley, distance 83.6 miles.



F. G. SOMNER.

At least one venerable citizen of Bishop has expressed himself simply but fervently as being "thankful to the good Lord for being permitted to live to ride over a good road from Bishop to Independence, the county seat of Inyo County." Added happiness to declining years is in itself more than meager return to those of us not devoid of sentiment and whose endeavors may have brought about these changes.

At the creation of District Nine in October, 1923, a stretch of oiled macadam north of Bishop 8.37 miles in length, together with an eight mile stretch of 8 foot concrete pavement between Big Pine and Independence comprised the hard surfaced roads within the Owens Valley. The other portions may best be described as being in general "two ruts in the sand."

As the balance of the roads were generally in no better condition and in places much worse, it was the purpose to first facilitate travel over the whole district, always followed by an increase of travel with attending increased demand on the limited funds available. There was, therefore, little opportunity to concentrate in proper and orderly fashion on any particular stretch of road, so temporary expedients with recourse to the materials immediately at hand, such as sand, clay surface and decomposed granite was the order of the day.

The surface oiling in 1921 on the Sherwin Hill had proved a failure, necessitating the removal of several miles of corrugated oil cake, which did not have a tendency to encourage further attempts at oil processing, either mixing or penetration method. However,



Upper picture, Sand Dunes in Death Valley.
Lower view, At the summit of Mt. Whitney.

adverse conditions were offset by an appreciative spirit and an unanimous support on the part of the citizenship of the valley, unprecedented in the writer's experience, thus stimulating efforts to remedy matters. A marked improvement soon became noticeable throughout the valley.

In the season of 1926 experiments were made with both light and medium oil, applying from one-fourth to one-half gallon per square yard on stretches aggregating 30 miles, covering surfaces of volcanic cinders and decomposed granite. In the season of 1927-28 the road mixing method was employed throughout, covering both decomposed granite and crushed rock surfacing and including the rehabilitation by mixing method of portions of the roads oiled in the previous year by the penetration method, adding from three-

(Continued on page 17.)

1928 Road Developments in California

By C. H. PURCELL, State Highway Engineer *

PROBABLY the more important developments in this state during 1928 were: Application of fuel oil to crushed stone road surfacing.

Reduction of roughness on asphalt concrete pavement.

Increased use of timber bridges.

Increased attention to appearance of highways.

The State of California is faced with the problem of grading and surfacing a large mileage of highways. It is not possible financially to pave this mileage as fast as it is graded nor does good engineering practice permit of paving new grades involving substantial embankment until after several years' settlement. Also in desert and mountainous regions, present traffic does not at this time justify pavement. The Division of Highways, during the current year, is constructing a considerable mileage of crushed rock surfaced roads with the top three or four inches of the road metal treated with fuel oil. Three methods are employed in applying the oil; penetration method, plant mix method, road mix method. The major portion of this type of construction is located in the mountainous and desert region. In these localities it is believed that the oil treated crushed rock surface will be adequate for a number of years. In localities where traffic is heavier, the oil treated surface is intended only to bridge over the period until paving may be accomplished. The oil treated crushed rock furnishes a superior surface to the untreated metal and eliminates the necessity for restoring the road metal every few years; however, the general maintenance is not reduced.

In the construction of asphalt concrete pavements in this state it has always been very difficult to get a smooth surface; the asphalt concrete pavement could not compare in smoothness with Portland cement concrete pavements. The introduction of the machine finish on asphalt concrete pavements has resulted in producing a smoothness of finish which is but little inferior to the best Portland cement concrete pavement. The description of these machines and the methods of using them have been given in various technical magazines and are not repeated here.

In the past the great majority of short span bridges have been constructed of concrete.

These were constructed as permanent structures; however, the large increase in traffic, both in volume and in speed, has resulted in increasing the standard of highway construction, particularly the location, to such an extent that many of the small concrete bridges have to be abandoned. The Division of Highways is now constructing concrete bridges only on locations where there is no doubt as to the permanency of the location. In other locations and in the desert regions where the cost of concrete materials is prohibitive, timber bridges are being built, either of treated fir or untreated redwood. Untreated redwood compares very favorably with treated fir as regards life. The Bridge Department, with the cooperation of the California Redwood Association, has prepared a set of grading specifications which insure a dependable quality of redwood timber for structural purposes.

Attention is being given to having the highway right of way in as neat and sightly a condition as possible, as well as to take advantage of the scenic possibilities of the country as far as consistent with good highway location. Particular care is being taken to restrict the clearing operations to the end that only the timber and shrubbery which interferes with the road is destroyed; also that the cleared area is left in a neat condition. Care is also taken to see that the roadbed and slopes are left in a neat condition upon the completion of grading. The Surveys and Plans Department, the Construction Department and the Maintenance Department are cooperating with each other to the end that when the highway is constructed it is left in such shape that the entire width of right of way can be maintained in a neat condition by the Maintenance Department. A landscape engineer is employed to assist in this work.

The finances for highway construction and maintenance in this state are well provided for, the annual revenue available for state highway construction and maintenance being approximately thirty million dollars per year. This insures an extensive construction program after taking care of maintenance. The program for 1929 includes bridge work amounting to approximately three million dollars, a considerable mileage of heavy grading, and a substantial amount of paving. Highway work constitutes the major portion of con-

* This article was first published in the January issue of *The Earth Mover*.

Toll Bridge Report Submitted to Legislature by Highway Commission

“THE FURTHER construction of all privately owned toll bridges should be prohibited.”

In the above sentence, Governor C. C. Young summarized the findings of the Department of Public Works relative to toll bridges in California. The report was made in compliance with an act of the 1927 legislature requiring the California Highway Commission to investigate and report with recommendations upon the construction and operation of privately owned toll bridges in California.

The report was transmitted to the California Highway Commission by B. B. Meek, director of the Department of Public Works. Mr. Meek concurred in both the findings of the report and the recommendations contained therein.

The report comprises over 200 pages of typewritten matter, and in addition to the text contains many pages of maps, charts, exhibits and other supporting data. The investigation was made under the immediate direction of C. H. Purcell, State Highway Engineer, and Chas. E. Andrew, Bridge Engineer of the Division of Highways. The report constitutes a very complete and exhaustive study of toll structures.

SUMMARY OF FINDINGS

The recommendation that further construction of privately owned toll bridges in California be prohibited is based upon the following findings:

The cost and operation of the privately owned toll bridge is excessive;

Tolls are far in excess of those necessary to operate and amortize the cost of similar state-built and operated structures. The rates of tolls on the Carquinez and Antioch bridges “indicate that the cost of public service on the present bridges is at least 88 per cent higher than it would have been on similar bridges constructed and operated by the state.”

The state can not acquire private toll structures after their construction at a value consistent with that for which the state or counties can build or operate them.

ADVOCATE PUBLIC BRIDGES

As an alternative for the privately owned and operated toll bridges, the report recommends that “necessary steps be taken to permit the state or counties to finance or build toll bridges” by the issuance of bonds payable out of the income of such structures.

CONCLUSIONS REACHED

The conclusions contained in the report are summarized as follows:

1. The expense of promotion and organization of a privately owned toll bridge is in many cases a major item in its cost. The report states that promotion and organization expenses in the case of the Carquinez and Antioch bridges totaled \$1,166,776. Compared with this the organization costs of the same bridges had they been publicly financed and built by the state is estimated at \$153,500. Promotion and organization expenses of the San Mateo-Hayward bridge, including both money and stock allotments, are estimated at \$785,670 as compared with an organization charge of not to exceed \$160,000 for a similar state built structure.

2. Private interests have been quick to recognize the possibility of capitalizing for their own benefit the huge investment made by the public in state and county highways. In the case of the Carquinez bridge it is estimated that private interests anticipated state recognition by at least five years.

3. It is charged that private promoters often build or attempt to build toll bridges on locations where the traffic does not justify them. This is done for the apparent purpose of collecting promotion fees or because the probability of future increase in traffic seems to justify a present investment.

4. The cost of tolls on the San Mateo-Hayward bridge, if the structure had been state financed and built, but operated on a toll basis, is estimated at about 35 per cent of the present authorized toll schedule for the 47 years period that constitutes the life of the franchise.

5. The cost of financing privately owned toll bridges is declared excessive. Thus the report states that the cost of financing the Carquinez and Antioch bridges, owned by the American Toll Bridge Company, includes a stock bonus of 500,000 shares and an item of \$673,853 for bond discount. Computing the stock at par value of \$1 a share, the discount on a \$6,500,000 bond issue totals \$1,173,753. The bonds bear 7 per cent on \$4,500,000 and 8 per cent on \$2,000,000 as compared with 4½ per cent for which state bonds can be sold at par, or 6 per cent if bonds secured by the income of the bridge were used. On the San Mateo-Hayward Bridge, the interest rate on bond financing, including all charges, is given as 7.7 per cent and for the Dumbarton Bridge 7.3 per cent.

6. As far as the investigators were able to ascertain, no actual money was paid for any of the 120,000 shares of common stock issued by the company building the San Mateo-Hayward Bridge. On the lowest traffic estimate the stock will have a present worth of \$33 per share with a reasonable possibility that it will go to \$79.50 per share. This stock is held by those directly interested in the bridge. The worth (\$3,960,000 to \$9,540,000) will accrue to the common stock owners without capital investment, other than services rendered prior to the opening of the bridge.

7. The reproduction costs by the state of the Carquinez and Antioch bridges is estimated at \$7,675,900 as compared with the actual cost for the structures of \$9,520,789 to the American Toll Bridge Company. The difference in cost is attributed in part to lack of competitive bidding. In general it is estimated that

the cost of constructing a privately owned toll bridge is from 10 per cent to 25 per cent higher than for a public structure.

S. The cost of operation of these two bridges is declared excessive as compared with bridges built and operated by the state. The figures are: Combined annual cost of operating Carquinez and Antioch bridges, \$1,176,000; estimated cost if built and operated by state (6 per cent financing) \$918,600.

TOLL CHARGES COMPARED

It is declared that average tolls on the Carquinez Bridge, until 1948 when the bridge becomes free, if built and operated by the state, would be 44 cents a vehicle as compared to an average toll of 82 cents, under present conditions. If financed by the state on a $4\frac{1}{2}$ per cent basis, the average state toll would in its turn be cut from 44 cents to 38 cents a vehicle. If the state had financed the San Mateo-Hayward Bridge, an average toll of 15 cents for pleasure cars and 58 cents for commercial vehicles would operate and amortize the cost of the structure during the life of the franchise (1930-1977), as compared with the following authorized tolls for the private structure: 1930 to 1950, 60 cents for pleasure cars, \$1.75 for commercial cars; 1950 to 1957, 56 cents for pleasure cars, \$1.66 for commercial vehicles; 1957 to 1977, 38 cents for pleasure cars, \$1.13 for commercial vehicles.

HIGHWAYS AND TOLL BRIDGES

Discussing the highway situation generally as it affects toll roads, the report calls attention to the fact that in California 95 per cent of the roads and bridges are owned and operated either by the state or by counties.

"It should not be necessary nor should private capital be allowed," the report continues, "to pick out advantageous points on the highway system and build toll bridges or roads that will take profits that would otherwise tend to lessen the average cost of highway service on the entire public highway system. * * *

"The economic construction and operation of the public highway system should be from a standpoint of the entire state or nation rather than from a local point of view as a city or county. * * * The argument that a city or county can make money from a toll bridge is fundamentally wrong. It is not economically sound that the citizens of one county or city should travel free on the roads of any other county or city or upon the state highway system, and in turn exact a profit from travelers outside of their boundaries using their roads or bridges.

"The present enormous investment by the public in state and county highways is being capitalized by private toll bridge companies."

RECOMMENDATIONS

Specific recommendations included in the report are:

Existing laws governing the issuance of franchises for toll bridges as well as their construction and operation are obsolete. If it is decided to continue to grant franchises for toll structures to private parties, it is recommended that the right to grant such franchise be vested either in the California Highway Commission or be made subject to the approval of that body, and that the rates of tolls be fixed by the Railroad Commission. The present laws relating to the right to operate toll bridges and the method of granting franchises therefor date back to 1872 and 1881. The report commenting upon this fact says: "No amendments have been made which change the principle of

the application of these laws. They are based upon the principle of delegating their rights to the counties and therefore are found to be more or less incompatible with the existing idea of a state highway system."

It is further recommended that the law vesting authority over franchises in a county on the left bank descending of a stream be amended, if franchises for privately owned and operated structures are to be continued. This provision is declared difficult of determination in the case of San Francisco Bay.

It is suggested that power be given to the Highway Commission or to the Department of Public Works to "locate, design, construct and operate" toll bridges and to finance the same by issuing income bonds having as their sole security the income from tolls.

If the legislature has the power to do so, it is recommended that legislation be enacted giving the Highway Commission or the Department of Public Works authority to acquire existing privately owned toll bridges by purchase. Methods of acquiring these bridges are discussed and the conclusion is expressed that condemnation is the only practical proceeding to employ. It is pointed out that there is a wide variance in the value placed upon a structure depending upon the valuation method employed.

COST OF BRIDGES

It is estimated that the acquisition of all of the privately owned toll bridges in California, either now operating or which will be operated in California in 1929 will require a capital investment of \$20,156,300, if the price paid is based on the cost of bridges to the toll bridge companies. The total cost of reproduction of all of these bridges by the state is estimated at \$16,250,900.

Computed on state traffic prediction and a 6 per cent reinvestment basis, the report finds that the price of the Carquinez and Antioch bridges would be \$11,846,400 and of the San Mateo-Hayward Bridge, \$14,457,490. Even paying \$11,846,400 for the Carquinez and Antioch bridges and financing their purchase with 6 per cent bonds, the report declares that the present average toll of 82 cents per vehicle on the Carquinez Bridge and 84.2 cents per vehicle on the Antioch Bridge can be reduced to 52 cents and 61 cents, respectively. A substantial reduction can also be made, the report declares, in the tolls that its franchise will permit the San Mateo-Hayward Bridge to charge, when that structure is opened to traffic.

The report calls attention to the fact that not all of the toll bridges in the state are located upon the state highway, but that all are more or less important links of highway traffic. Their acquisition would accordingly require additional expenditures for connections with the state system. The report discusses at some length this phase of the subject, and analyzes the bridge locations both with reference to the service that it affords travel, and the service afforded by alternate routes. The same analysis is made of proposed toll bridge projects.

TOLL BRIDGES IN CALIFORNIA

The report is based upon a close study and an expert analysis of the seven privately owned toll bridges in California. These include three bridges owned and operated by the Sears Point Toll Road Company in Solano and Sonoma counties; two bridges over the Sacramento and San Joaquin rivers, owned and operated by the American Bridge Company, one known as the Carquinez Bridge, the other as the Antioch Bridge; the Dumbarton Bridge crossing the southerly arm of the San Francisco Bay, owned and operated by the Dumbarton Bridge Company; a bridge

Investigation Into Financing of Toll Bridges Asked in U. S. Senate

A CONGRESSIONAL investigation into methods of financing the construction of toll bridges is proposed in a resolution introduced in the U. S. Senate on December 10 by Senator Oddie, of Nevada.

The resolution calls for the appointment of a select joint committee of three senators and three members of the House who would be directed to carry on the investigation and to report at the first session of the next congress. Among the phases of the subject which would be investigated would be the question whether public or private construction of toll bridges is most advantageous to the public, and the degree of supervision which should be exercised by the public over the construction and financing of bridges erected by private capital.

The resolution was referred to the Committee to Audit and Control the Contingent Expenses of the Senate. It follows in full text:

Resolved by the Senate (the House of Representatives concurring). That a joint select committee is hereby created, to be known as the Select Joint Committee to Investigate Toll Bridges on the Public Highways and Ferries, which committee shall consist of three Senators who are members of the Committee on Post Offices and Post Roads, to be appointed by the Vice President, and three members of the House of Representatives who are members of the Committee on Roads, to be appointed by the Speaker, said appointments to be made from among those who are members of the seventy-first congress.

Sec. 2. Said committee shall investigate and report to the seventy-first congress during its first session upon the following subjects:

1. Whether existing congressional legislation authorizing private companies or persons to build toll bridges upon the public highways of the United States adequately provides for the safety and permanence of such structures erected or to be erected and for their adequate inspection during construction.

PUBLIC CONSTRUCTION SUGGESTED

2. Whether, since all such bridges will ultimately become the property of the public, it is in the public interest that it have control over their initial construction and future maintenance.

3. Whether, in view of the fact that under existing federal highway legislation congress has required the states to agree that the roads shall be free from tolls, which requirement the states have accepted, it be just and reasonable to grant franchises permitting a revival of a system of toll gates in the form of toll bridges.

4. Whether, as currently reported, franchises granted by congress for the building of private toll

bridges have been sold, offered for sale, or made the subject of trafficking.

CAPITALIZATION TO BE STUDIED

5. Whether there has been excessive and extravagant capitalization of toll bridge structures, which is reflected in the tolls paid by the public and in the value of the securities purchased by it.

6. Whether the public has demonstrated its willingness and ability to finance the construction of large bridges on as favorable or more favorable terms than private interests, and whether in such cases the use of such structures ultimately is made free to the public at an earlier period than when constructed by private capital, although a toll charge for their immediate use may have been temporarily necessary.

Sec. 3. Said committee shall also make investigation with respect to existing toll bridges on the public highways and ferries connecting therewith, such investigation to include the original investment therein, present value, outstanding securities, rate of tolls, dividends, salaries, traffic carried, and other related and pertinent matters; also the status of franchises granted, including the activities of agents in procuring such franchises, together with the disposition of such franchises by sale or otherwise.

New District Equipment Shops at San Luis Obispo

New buildings to house the district and equipment shops are now being constructed in District Five at San Luis Obispo on a new site recently purchased by the state for this purpose.

The new site, containing 5.7 acres located on the Coast Highway, at the southerly city limits adjacent to the Pacific Coast Railway freight yards, one mile from the center of the city, is considered to be the most advantageous location to be found in the vicinity whereon to erect the buildings necessary for maintaining highway equipment. It is the ultimate purpose to have all district buildings, including administration office, maintenance shops and storage buildings, located on the same property.

The first unit of the construction under contract and under way includes a shop building 100 feet 6 inches by 60 feet and equipment storage shed 192 feet 6 inches by 25 feet, both structures being of timber frame covered with galvanized corrugated metal. Additional small buildings will complete the construction at this time.

OREGON—Mountain road contracts totaling \$1,426,000 have been in progress in Rainier National Park. Beauty spots heretofore to be seen only by slower means of travel will be visited by thousands of motorists in 1929.

Highway Research in the United States

T. E. STANTON, Materials and Research Engineer.

FOLLOWING attendance at the Fourteenth Annual Meeting of the American Association of State Highway Officials at Chicago last November the writer took advantage of the opportunity to visit the State Highway Testing Laboratories in Missouri, Illinois, and Iowa, as well as the laboratory of the Portland Cement Association and the Chicago Paving Laboratory in Chicago, and the laboratory of the American Rolling Mills Company at Middletown, Ohio.

A vast amount of highway research work is being done by the United States Bureau of Public Roads and by many of the state highway departments. The Association of State Highway Officials constitutes the principal medium for the exchange of ideas and the coordination of all such activities; in fact, the general interest which is now being taken in the subject may be said to date from the organization of the association, and if this were the only beneficial result the existence of the association would be justified.

STANDARDIZING SPECIFICATIONS

Standardization of specifications has resulted and the Department of Agriculture through the Bureau of Public Roads has issued Department Bulletin No. 1216 dealing with the "Tentative Standard Methods of Sampling and Testing Highway Materials as adopted by the American Association of State Highway Officials and approved by the Secretary of Agriculture for Use in Connection with Federal Aid Road Construction."

STANDARDS BETTERED

Before the inception of the policy of federal aid in road building and the organization of the State Highway Officials Association there were many states in which the standard of highway construction was at an exceedingly low ebb. Politics dominated to such an extent that not only were highways being built in improper locations but millions of dollars were being wasted on inferior construction. This situation was of vital concern to the entire United States, imposing as it did a heavy burden in operation cost on every motorist who desired to pass through or visit points of interest in states where a good road was an unknown quantity.

Through the magnificent work which has been done by the Bureau of Public Roads this situation has been or will very shortly be

entirely corrected. The bureau's efforts, however, would have been much less effective had it not been for the support and influence of the state highway officials working through their national association.

RESEARCH PROJECTS

The report of the research committee, of which V. L. Glover, Materials Engineer of Illinois, is chairman, shows 525 research projects reported completed or in progress by the various states. It is very probable that more than double this number have actually been undertaken, but many in such a small or haphazard way that they were not reported by the states.

Without doubt there is considerable overlapping of research work and a great deal of money and effort is being wasted by duplication of projects. One of the main problems of the research committee is to coordinate the activities of the various states and bring about a greater degree of cooperation. The results of the major part of the investigations carried on are seldom published. The value which might accrue to others is, therefore, lost, and those conducting the work also lose the valuable criticism which publication usually elicits.

WILL MAKE CONCLUSIONS PUBLIC

It will be the policy of the California Materials and Research Department to prepare for publication in the Official Bulletin from time to time articles dealing with its research activities to the end that any knowledge gained thereby may be made accessible to others.

RESEARCH EXPENDITURES

Over \$750,000 was reported by the Bureau of Public Roads and the State Highway Departments as being spent annually on research work. Without doubt the actual expenditures by all agencies engaged in this class of work is well over \$1,000,000 per year.

This is but a small fraction of the total expenditures for road work in the United States, however, which are reported to have been over \$1,200,000,000 for 1926 outside of incorporated cities and national forests and parks.

WORK IN OTHER STATES

While practically all of the states are taking an active interest in highway research the

states of Illinois, Iowa, Minnesota, Missouri, and Pennsylvania have particularly active departments presided over by capable executives.

A new building is being erected in Jefferson City, Missouri, to house all of the activities of the highway department. The materials and testing department will occupy the lower or basement floor of this building.

As in California, a special building has been erected for the materials department both at Springfield, Illinois, and Ames, Iowa.

There is a growing tendency to thoroughly equip and finance the materials and testing departments in the more important road building states, thus evidencing the importance which this branch of a highway organization is assuming.

WORK IN CALIFORNIA

None of the laboratories visited have any superiority over California in location and general set-up. Some are better equipped for certain lines of testing, but none of the states have the wide variety of work carried on in California and, for that reason, their research activities are, for the most part, confined to a narrower field.

Most of the pavement laid during recent years in Illinois, Missouri, and Iowa has been of the Portland cement concrete type. Most of the investigational work carried on by these states, therefore, has been concerned with this type.

INTEREST IN CALIFORNIA PAVEMENTS

The primary roads in these states, however, are nearly completed and they now face the problems of finding a cheap surfacing for their large mileage of secondary roads. Increasing interest was found, therefore, in the investigations which have been carried on by California in connection with the surfacing of our light traffic highways with what is known as the California oil mix type. At the request of the Program Committee the writer led the discussion on "Bituminous Surface Treatment of Crushed Rock and Gravel Roads" at the group meeting on maintenance and traffic control.

CURING CONCRETE

A number of investigations are being made by the laboratories relative to the value of different methods of curing concrete pavements in order to get away from the conventional curing method of wet earth covering or ponding with water. Many of the eastern states have adopted calcium chloride or sodium silicate as the preferred curing agent. Tests in California, however, where little rain

can be expected during the dry period of the year, indicate that these methods are not as effective as water curing.

As in California, most of the eastern states exercise close laboratory control over the materials used in concrete construction with the result that the pavements now being laid are of a much higher quality than the pavements of but a few years ago.

The practice in Missouri and Illinois is to drill cores from the pavement from 250 to 500 feet apart for the purpose of accurately determining the thickness of the constructed pavement and for making strength tests.

COOPERATION IN RESEARCH

It is the practice of the most active of the eastern and middle western states to maintain a close contact with the National Research Council and to send their material men to attend the annual meeting of the council in Washington. The men from these states also attend an annual summer meeting in Washington of the Committee on Materials of the State Highway Officials Association. Most of the real conference work of the committee is done at this special summer meeting.

On account of the distance few of the western states have sent their material men to attend the summer conference. In order to remedy this situation and make it possible for the western members of the committee to take an active part in the work it is proposed to revise the organization of the committee on materials so as to provide for a western section to be composed of those members of the committee representing the eleven Rocky Mountain and Pacific coast states, as follows: Montana, Wyoming, Colorado, New Mexico, Idaho, Utah, Arizona, Nevada, Washington, Oregon and California.

The western section is to be organized primarily in order that the members of the committee representing the eleven western states may have an opportunity of meeting for the purpose of discussing methods of tests and specifications with special reference to their application in the section of the country which they represent.

OTHER RESEARCH AGENCIES

The Portland Cement Association has a building of its own in Chicago and has a fully equipped research laboratory connected therewith. This laboratory is in charge of Mr. H. F. Gonnerman, a specialist in hydraulic concrete research. Mr. Gonnerman conducted the party through the laboratory in Chicago and participated in a general discussion relative to the results of some recent tests which have been conducted both by his association

California State Highway Policies

By C. C. YOUNG, Governor of California

The following article comprises those portions of the Biennial and Budget Messages of Governor C. C. Young to the State Legislature of 1929 dealing with the progress of the State Highway System and the policies that govern its development and administration.

The director of the Department of Public Works serves as the head and administrative officer of the Division of Highways. The work of road building in California has of late years properly assumed very great importance, being only second to education in cost, both to the state and to the various counties. At the beginning of the present administration, only about \$5,000,000 a year was available for the construction of new state highways, the bond issues previously used for that purpose having been exhausted some years before. The gasoline tax then coming to the state was used entirely for reconstruction, maintenance and repair.

Gasoline Tax Allocated by Law. At the 1927 session of the legislature, the Breed Gasoline Tax Law was so amended as to provide a three-cent gas tax. Of this, one cent goes to the counties (to be shared with the cities as may be found desirable), one cent goes to maintenance and reconstruction of state roads, and one cent to the constructing of new state highways. A State Highway Commission of five members, serving without pay, acting on the basis of facts ascertained by the engineers, at the beginning of each biennium allocates the funds to various highways of the state. The percentage of overhead cost is being steadily reduced, efficiency of operation is being increased, and it can probably be said that, both in extent and quality of road construction and in its business-like administration, California stands at the forefront of all the states.

BUDGETING OF HIGHWAY EXPENDITURES

New Budget Policy. Up to two years ago, road construction was not mentioned in the state budget except an item of \$20,800 per year for the salaries of the highway commission and highway engineer. The 1927 budget, however, published not only an estimate of highway expenditures for the succeeding biennium, but also gave a list of specific expenditures proposed for reconstruction of state roads. This marked the inauguration of a new policy in state highway affairs in California, that of frankly telling the public in advance of expenditures just where and how it is proposed to spend highway funds.

Original Gasoline Tax Plans. The maintenance and reconstruction program in this first budget involved total expenditures of \$27,100,000, a like amount being allotted to the counties as their share of the two-cent gas tax. Supplemental allotments of increased revenue and savings on contract awards brought the total of this budget to \$28,577,517 for the biennium.

Highway Funds Total. In January, 1928, the additional cent gas tax for the construction of new roads became effective, and a detailed budget of the new roads proposed, and the amount to be spent on each, was at once published. This budget allocated \$15,100,000 for new construction, this being the estimated available income from the one-

cent gasoline tax for the eighteen months of the biennium during which the new law was effective. The budget for expenditures of federal road money (Third State Highway Fund) totals \$5,582,834. The total of the budgets of all these state highway funds for the present biennium, therefore, aggregated \$49,260,351. This does not include the money turned over to the counties for highway purposes, which aggregated \$26,000,000, and which was included in the budget, since it represents an allocation of revenue raised through state law.

Budget for Next Two Years. The budget for the 1929-1931 highway program with the funds specifically allocated for new construction and reconstruction has been completed, and is being submitted in the accompanying budget message. The highway program of the state has become so important, and the sources of its revenues are so distinct that, for the sake of convenience, it has been thought wise to segregate the highway budget from the budgets of expenditures for educational and for general purposes. Field work looking toward the preparation of the highway budget for the biennium of 1931-1933 has already been begun.

Highway System to Date. There are now 6565 miles authorized as the state highway system, 4273 miles being of primary and 2292 miles of secondary roads. Of this mileage 2465 are graded and paved; 1350 miles are graded and surfaced; 517 miles are merely graded and not yet paved or surfaced; while 2233 miles have as yet had no work done upon them by the state.

POLICY AS TO NEW STATE ROADS

Policy as to the Inclusion of New Roads in the State System. At this time it will be necessary to establish some policy relative to the inclusion of new roads within the state highway system. There is a certain "orphan" section of highway which, by error in description, by oversight, or through other fault, was not included in the state system when the parent roads were designated as state highways. This probably should be annexed to the present system at once. It comprises about 5 miles. But aside from this I am very doubtful whether other additions can be made just now without disrupting our entire highway program.

Method, Priority and Time of Adding New Roads. There are certain other roads, now a part of county highway systems, that are largely devoted to state rather than local uses. These roads clearly have prior rights to become a part of the state system, when that system is expanded. The question now is as to when such transfer should take place. I would suggest to the Director of Public Works that during the next two years he make a comprehensive traffic study of those county highways in California which now serve as arterial highways, or of routes not now in the state system of probable arterial value, to determine what roads should be added to the system, and the order in which they should be added as determined by

state use and traffic needs, together with an estimate of the probable time when such roads can be included in the state system without imposing an impossible burden on that system.

Recommendation of Department Necessary. No Governor should be asked or expected to sign a bill providing for the extension of the state highway system, except upon recommendation of the Department of Public Works—a recommendation in its turn based upon a careful study of traffic requirements and highway use, in line with the broad general policy of long-time planning. Any other plan will break down our program of highway construction and will savor of political expediency rather than of safe and business-like procedure. Whatever policy may be adopted must be based on traffic and not political pressure.

HIGHWAY AND BRIDGE CONSTRUCTION

Moneys Distributed as Required by Law. Particular attention is being given to increasing the volume of winter highway work as a means of assisting in the relief of seasonal unemployment. Allocation of funds, both for new construction and for reconstruction, has been made in strict accordance with the Breed bill. In this connection it should be clearly understood that a balance as between construction expenditure in the northern and the southern group of counties can not economically be maintained on a day to day, week to week, or month to month basis. In the northern counties work must be largely prosecuted during the summer months, if due regard is to be given to economy in construction. The southern group of counties offers advantages for winter work, work highly desirable because of the aid to seasonal unemployment that usually prevails during the winter months. Accordingly during the summer the northern group of counties will inevitably show a greater ratio of expenditure than the southern group, while in the winter conditions will be reversed. A biennial financial balance, however, is entirely possible and will be maintained.

Volume of Work. The importance to California of state highway expenditures is shown by the fact that the volume of these expenditures authorized to date (January 7th) for the biennium reached the huge total of \$41,346,184. This money is distributed all over California, furnishing a large, immediate market both for labor and goods, as well as contributing to the future development of the state.

Toll Bridges. The policy of the state can be expressed as opposed to privately owned and controlled toll bridges on the state system of highways, but not opposed to publicly constructed, owned and operated toll bridges where adequate public funds are not now available for the construction of free structures. In all cases, however, the aim will be to amortize these investments as rapidly as possible, in order to be able to turn them over to the public, free from all tolls, at the earliest possible date.

HIGHWAY SAFETY AND BEAUTIFICATION

Increasing Safety of Highways. Increased attention is being given to make the highways of the state safer for travel. This is being accomplished through the elimination of dangerous curves; the separation of railroad grade crossings; striping the highways and thus providing defined travel ways; the abatement of the dust danger through oiling operations; betterment in alignment; more adequate protective signing; reduc-

tion in the crown of roads; increase in road widths; filling borrow pits; increase in guard rails, etc.

Wider Rights of Way. During the present biennium, substantial progress has been made toward securing the 100-foot right of way as the minimum requirements of all main north and south state highways and on all other important arteries of travel. Notable examples of highways where the minimum right of way of 100 feet has been obtained are the Foothill Boulevard in Los Angeles and San Bernardino counties, and the Bay Shore Highway in San Mateo County. On practically every road which was built or reconstructed during the present fiscal year the ultimate width desired for right of way was obtained before contracts were let.

Highway Beautification. A definite campaign which is winning widespread support has been launched to save the scenic values of highways, by preventing their injury through unsightly roadside structures and by billboards which, while properly situated in commercial areas along highways, yet have no place along our scenic roads. Study of the highway system is being made to determine those areas of particular scenic charm, recreational value and historical interest, lying adjacent to the highways, that should be preserved. Model sections are being planned at various points to show planting methods by which roadside beautification can be accomplished. An effort has been made to assist in the "Save the Beaches" movement, and care has been given to the preservation of roadside trees and shrubs and other trees, of unusual interest or importance, although growing off the highway right of way.

PRISON ROAD CAMPS

Original and Purpose. Convict labor on highways is no longer an experiment in California. It has been in existence for fourteen years, being first authorized by the legislature of 1915. Although such labor costs practically the same as road building by contract, it has more than justified itself by the good it has done for the prisoners themselves. The work is for the most part in rough mountain country, and the men are practically unguarded; yet attempts at escape are very few, as are also the numbers of former road camp prisoners who drift back into crime after their release.

Convict Road Projects. The number of convict highway projects is now eight as compared with three such projects during the winter of 1927-1928. The expansion of convict camp work has meant the average employment on highway work from March 1, 1928, to December 1, 1928, of 490 prisoners. This has relieved the state of a considerable burden of expense in the maintenance of prisoners in San Quentin. It is estimated that the average employment of 650 convicts on road projects saves \$150,000 a year in their prison upkeep, besides doing immeasurable good in so rehabilitating them physically and mentally as to enable them to "go straight" at the expiration of their term. The small percentage that return to crime after a road camp experience is very gratifying.

Nearly Six Hundred at Work. There were 571 prisoners at work on state highways on December 1, 1928, all of them being paid a small wage for their work. Out of the earnings of the prisoners, a substantial sum has been allotted by them to the care of dependents. Those without dependents save something to aid them in starting life anew. It is worthy of note that out of every one dollar

spent on convict highway projects approximately eighty cents goes directly or indirectly to free labor.

BUDGET MESSAGE TO THE LEGISLATURE

In his budget message Governor Young discussed state highway matters as follows:

In order that those directly interested in state expenditures for highway purposes may find in one section all such items, the expenditures for highways have been segregated to comprise a separate highway budget. The highways of California now receive the largest portion of the state's funds, when state-aided county roads are included. Highway expenditures at the present time amount to 44 per cent of the total budget.

California spends vast sums upon her highways and does so at the dictum of her people, who appreciate fully the value of good roads in the development of the state. Revenues for state highway construction come mainly from the gasoline taxes which the people have voted and which seem to find universal approval, although there are considerable contributions to these revenues from automobile licenses and from the tax franchise imposed upon commercial automotive vehicles. The Governor has no control over these funds, even the allotment of them being apportioned by law. The budget for the coming biennium reaches the total of \$106,432,790.

This sum includes every expenditure for highway purposes, whether disbursed directly by the state, or indirectly through the agencies of the counties. Statute requirements are that one-half the original gasoline tax of two cents per gallon, less the cost of collection, shall be turned over to the counties. The same law applies to the revenues received from the annual issue of automobile licenses and the gross receipts tax levied upon commercial vehicles. The state receives in addition to its half of these funds, all the one-cent gasoline tax, but must spend it for new construction only. The state also receives additional revenues from federal aid.

The Highway Budget, therefore, is more a budget of and by the legislature, than a product of the Governor's office, but is included herewith in keeping with the general plan that every dollar of state expenditure shall be shown in this document. I congratulate the legislature that its plans for highway financing have been thoroughly successful, and that through the moneys now received an orderly program of maintenance, reconstruction and new construction of highways in California can proceed at good speed without recourse to bond issues. Your attention has been directed to the great saving effected through the "pay-as-you-go" plan of financing new road construction, as compared with the old bond issue method.

PAST AND PRESENT METHODS OF FINANCING HIGHWAYS

It is pointed out in my message covering the entire budget that if the \$27,400,000 of proposed expenditures for new highway construction in the next biennium had been provided by the issuing of bonds maturing over a period of forty years, at 4½ per cent interest, the construction eventually would have cost the people of the state \$51,272,250. The total highway bonds amounting to \$73,000,000 which already have been voted by the people during the past years for highway construction will cost \$153,869,913 when all of the interest has been paid and the bonds finally redeemed.

The wisdom of the legislature in proposing and enacting a tax on gasoline, which all users of the highway pay in proportion to their enjoyment of the benefits of these good roads, has been amply demonstrated. Construction through bond issue revenues increase such cost by 100 per cent. At the time of the beginning of the state highway system, when automotive equipment was in its infancy, the bond issue plan was the only one open to us. The immense growth of the use of gasoline-propelled vehicles and the consequent forging to the front of this fuel, permitted the employment of this special form of tax, with which to finance the highways necessary for the economical operation of such vehicles. The experiment has been so successful, the tax so easy of collection, the fairness of it so universally conceded, and the saving so great over the previous method of financing, it is most improbable that the people of California will ever revert to the issuance of interest-bearing securities for an enterprise of this character.

I pointed out in my message upon the General Budget that at the beginning of the present administration, only about \$5,000,000 a year was available for the construction of new state highways, the bond issues previously used for that purpose having been exhausted some years before. The gasoline tax then coming to the state was used entirely for reconstruction, maintenance and repair.

At the 1927 session of the legislature, the Breed Gasoline Tax Law was so amended as to provide a three-cent gas tax. Of this, one cent goes to the counties (to be shared with the cities as may be found desirable), one cent goes to maintenance and reconstruction of state roads, and one cent to the constructing of new state highways. A State Highway Commission of five members, serving without pay, acting on the basis of facts ascertained by the engineers, at the beginning of each biennium allocates the funds to various highways of the state. The percentage of overhead cost is being steadily reduced, efficiency of operation is being increased, and it can probably be said that, both in extent and quality of road construction and in its business-like administration, California stands at the forefront of all the states.

CALIFORNIA'S FIRST HIGHWAY BUDGET

Up to two years ago, road construction was not mentioned in the state budget except by an item of \$20,800 per year for the salaries of the highway commission and highway engineer. The 1927 budget, however, published not only an estimate of highway expenditures for the succeeding biennium, but also gave a list of specific expenditures proposed for reconstruction of state roads. This marked the inauguration of a new policy in state highway affairs in California, that of frankly telling the public in advance of expenditures just where and how it is proposed to spend highway funds.

The maintenance and reconstruction program in this first budget involved total expenditures of \$27,100,000, a like amount being allotted to the counties as their share of the two-cent gas tax. Supplemental allotments of increased revenues and savings on contract awards brought the total of this budget to \$28,577,517 for the biennium.

In January, 1928, the additional one-cent tax for the construction of new roads became effective, and a detailed budget of the new roads proposed, and the amount to be spent on each, was

at once published. This budget allocated \$15,100,000 for new construction, this being the estimated available income from the one-cent gasoline tax for the eighteen months of the biennium during which the new law was effective. The budget for expenditures of federal road money (Third State Highway Funds) totals \$5,582,834. The total of the budgets of all these state highway funds for the present biennium, therefore, aggregated \$49,260,351. This does not include the money turned over to the counties for highway purposes, which aggregated \$26,000,000, and which was included in the budget, since it represents an allocation of revenue raised through state law.

The budget for the 1929-1931 highway program, with the funds specifically allocated for new construction and reconstruction, is here presented. Field work looking toward the preparation of the highway budget for the biennium of 1931-1933 has already commenced. In all these the allocation is on the basis of traffic needs as determined by the Highway Commission, while the quota allotment as to the two ends of the state has been scrupulously followed.

There are now 6565 miles authorized as the state highway system, 4273 miles being of primary and 2292 miles of secondary roads. Of this mileage 2465 are graded and paved; 1350 miles are graded and surfaced; 517 miles are merely graded and not yet paved or surfaced; while 2232 miles have as yet had no work done upon them by the state.

The steadily growing costs of highway construction are shown by the following table showing budget totals and percentages of growth by bienniums:

Fiscal years of bienniums	Date limits of bienniums	Total expenditures for biennium	Percentage of increase
75th and 76th-----	1923-1925	\$48,171,317 48	-----
77th and 78th-----	1925-1927	69,132,927 74	43.51
79th and 80th-----	1927-1929	90,942,342 88	31.55
81st and 82d-----	1929-1931	106,432,790 00	17.03

No one objects, however, to these costs, partly because they are entirely borne by the users of the highways; partly because it is only proper that all the money coming from gasoline taxes and license fees should go to this purpose alone; partly because the public is convinced that our highways are being built in an efficient, economical, and business-like manner, with a minimum of overhead cost; and, finally, because our people are satisfied that California can have no greater asset than a well-planned, well-constructed, permanent system of state roads.

The train halted for a moment. A traveler reached out the window, called to a boy and said, "Here, son, here's 50 cents; get me a 25-cent sandwich and one for yourself." Just as the train started to pull out, the boy hurried up to the window and shouted "Here's your quarter, mister. They didn't have but one sandwich."

PENNSYLVANIA—More than a thousand miles of old stone roads have been reconditioned at moderate cost by applying two inches of new stone, rolling, adding tar, and then blading and rolling while tar is stiffening.

SCENIC DIKE ALONG KINGS RIVER HIGHWAY SAVED FOR PEOPLE

[From the *Fresno Bee*]

Forming the first spectacular approach to the Kings River Canyon on the new highway, for which location plans are now being completed, a great limestone dike that rises in a knife edge from the river just north of the Horseshoe Bend, will be preserved forever in its natural beauty, the Fresno County Chamber of Commerce was informed today by the National Forest Service.

The right to file on property in this area has been withdrawn by the forest service at the request of the chamber under an act of June 25, 1910, and June 10, 1920. The dike is the location of the famous Boyden Cave.

The new highway will be constructed by convict labor. The convict camp will be established on completion of the survey probably in the spring or early summer, according to Bert B. Meek, chief of the State Division of Public Works. Funds for operating the camp are obtained by special appropriation for the convict road building program.

Torches Are Used to Clear State Highway

[From the *San Bernardino Sun*]

Unique use of road torches has been discovered by the State Highway Commission, according to E. Q. Sullivan, district engineer. In addition to the use for which they were originally designed, melting down the bumps in asphalt pavement preparatory to smoothing them out, they can be used to advantage in melting away ice on the roads in the mountain districts.

This new use was first discovered last winter when one of the oil-burning road torches was used to melt ice which had formed on the highway in the "blue cut" in Cajon Pass. The Highway Commission now has two of these torches and yesterday a third was ordered at the request of Ben Bond, foreman of the Crest route, who believes a torch can be used to advantage on the road between Crestline Village and Squirrel Inn, where a heavy coating of ice forms during the winter months.

Mr. Sullivan explained that the torches cannot be used to clear the road of snow as well as ploughs, but they were very successful last winter in keeping the Cajon road clear of ice.

1928 ROAD DEVELOPMENTS IN CALIFORNIA

(Continued from page 4.)

struction activity on the Pacific coast, hence the competition among contractors is very keen.

With assured finances and a healthy contracting organization, it appears that highway construction in this state will proceed under favorable conditions for a number of years.

Traffic Stripes on Highway's Edge

1 1 1 1 1 1

THE TRAFFIC STRIPES recently painted on the section between the Herndon Bridge and Madera, have resulted in a popular demand for more of the same.

The pavement is 20 foot asphaltic concrete built in 1928. The striping consists of a white line 6 inches wide along each edge of the pavement and an orange line in the center. Oil mixed rock borders blended in so closely with the pavement that the edge of the roadway was hard to distinguish before the stripes were painted. The present lines define the traffic lanes and tend to speed up traffic considerably, particularly at night.

The orange line appears to have better visibility at night and in the fog. The white line along the edge is of particular advantage when meeting traffic as it defines the edge of the roadway and is always visible even when meeting a car with glaring headlights.

The center line draws traffic toward the normal driving lane and the side lines act to some extent in keeping it off the shoulders.

The side lines are more spectacular and therefore cause more comment, but District Engineer E. E. Wallace states that the center line is indispensable and the side lines are a great convenience. There is no question but that they add materially to the safety, speed and comfort of the traveling public.

The equipment used in marking the highway is a light truck and a Simons Paint Machine. The costs on this work vary according to the type and condition of the surface. A fairly open, porous surface will require as much as 18 gallons of paint per mile while a smooth, "close" surface will use about 13 gallons.

Where it is necessary to mark the line before painting, the cost of moving to the job, labor, equipment rental and supplies is about \$15 per mile of line. Where marking in advance is not required, the cost is from \$5.25 to \$6.35 per mile. This makes the total cost range between \$35 and \$55 per mile of line.

NEW YORK—In the Adirondack region traffic is largely for pleasure, and good stone is plentiful. These two factors combine to make bituminous macadam the most practicable type of road surface, a large mileage of which is being added each year.



View showing border stripes.

HIGHWAY STRIPES ARE LAUDED BY DRIVER FOR SAFETY ACCORDED TRAVEL

Corcoran, California, December 24, 1928.

California Highway Commission,
Sacramento, California.

Gentlemen:

Before I get out of the notion (which we so often do when in the mood to give credit to those who deserve) let me say that whoever inaugurated the idea of painting a wide yellow stripe down the middle of the highway and also when to this protecting line was added a white stripe painted along each edge of the highway such as I noticed in the neighborhood of Fresno, hit the safety idea right on the nose.

I recently made a night trip from Corcoran to Modesto and returned in the night, the round trip being made in a thick, heavy fog. I was able to jog right along and make good time in this dense fog at night, where the stripes guided me, with my windows frosted and fogged over badly. All other traffic moved along fine, but when we hit an unstriped highway, the timid dropped out one by one until dozens stood alongside the highway with their lights lit waiting for their nerve to pick up or the fog to lift or daylight to break. You know how pleasant that is. Those of us who absolutely had to move under such conditions drove blind and depended upon the quickness of our eye and hand.

If you are trying out this above safety idea I for one will say you are certainly doing the most important thing imaginable to keep traffic moving, and safely, in the foggy season of the year. It is also of almost as much benefit to night or day drivers the entire year around. I'm a one-time railroad train dispatcher, and safety first ideas are inborn. Those stripes on the highway, or which there are far too few, immediately struck me as one of the most practical and effective of any of the many safety devices yet employed to promote the safety of night and bad-weather drivers.

Yours very truly,

C. N. HAYES.

California Given \$2,495,345 Federal Aid Road Funds

A total of \$73,125,000 was apportioned by the Secretary of Agriculture for federal-aid highway construction for the fiscal year commencing next July 1, it was announced December 29 by the Department of Agriculture. The full text of the announcement, containing the allotments of federal-aid funds among the states and the Territory of Hawaii for the coming fiscal year, follows:

This apportionment has been authorized by Congress for continuing the federal-aid program, and the funds will be expended according to the same provisions which have governed past expenditures. In general the states pay half the cost of federal-aid construction. Federal-aid funds are administered by the Bureau of Public Roads and are available only for routes on the federal-aid system, which includes the main highways of the Nation.

During the last fiscal year improvements were completed on 8184 miles of federal-aid road which had not previously been improved with federal assistance, and advanced stages of improvement were completed on 2014 miles.

The apportionment is as follows:

Alabama, \$1,554,221; Arizona, \$1,061,111; Arkansas, \$1,284,382; California, \$2,495,345; Colorado \$1,388,755; Connecticut, \$477,110; Delaware, \$365,625; Florida, \$909,235; Georgia, \$1,980,443; Hawaii, \$365,625.

Idaho, \$933,902; Illinois, \$3,118,949; Indiana, \$1,917,036; Iowa, \$2,020,861; Kansas, \$2,058,305; Kentucky, \$1,417,634; Louisiana, \$1,026,696; Maine, \$678,501; Maryland, \$633,615.

Massachusetts, \$1,090,077; Michigan, \$2,204,966; Minnesota, \$2,108,104; Mississippi, \$1,311,391; Missouri, \$2,392,021; Montana, \$1,554,060; Nebraska, \$1,586,299; Nevada, \$960,375; New Hampshire, \$365,625; New Jersey, \$937,434; New Mexico, \$1,189,085.

New York, \$3,617,748; North Carolina, \$1,716,919; North Dakota, \$1,197,586; Ohio, \$2,754,446; Oklahoma, \$1,748,357; Oregon, \$1,191,989.

Pennsylvania, \$3,325,854; Rhode Island, \$365,625; South Carolina, \$1,061,447; South Dakota, \$1,229,282; Tennessee, \$1,609,662; Texas, \$4,531,162.

Utah, \$848,592; Vermont, \$365,625; Virginia, \$1,433,405; Washington, \$1,149,489; West Virginia, \$796,408; Wisconsin, \$1,854,580; Wyoming, \$939,536; total, \$73,125,000.

DO YOU REMEMBER WHEN —?

[From the *Orland Unit*]

B. B. Meek, director of the State Department of Public Works, estimates that about \$1,700,000 a year will be available in each of the secondary road districts of the state, northern and southern, for the coming six years. Does anybody present remember when road work depended chiefly upon poll taxes, and the big part of it was "worked out" by some one who had nothing in particular to do? In those days rails from a convenient fence were quite handy in boosting a wagon wheel out of a mud hole.

An association has been formed in Indiana to promote the construction of a 30-foot paved road from Lake Michigan to the Ohio River, opposite Louisville, Kentucky. Provisions will be made for sufficient right of way to permit building a 60-foot pavement later.

Courtesy of Highway Employee Praised By Newspaper Columnist

[From Rad's Ramblings in the *Merced Sun*]

We have additional reason for endorsing the work of the State Highway Commission, that gang of Bert Meek's that is making California highways the admiration of the tourist world. We mean an additional reason to the ordinary ones which include the conventional efficiency and all that sort o' thing.

We were motoring toward the beautiful mountains of Mariposa the other day, and you know if you've ventured up that way of late that the highway gang is straightening curves and widening the highway on that section of the road from Yosemite to the sea. We got up there about where Ben Cornett enjoys the blessings of bachelorhood and where the aforesaid highway gang operates a steam shovel or two. They have the highway rather mused up in two or three places, and we were proceeding blithely on our way with our much better half and as Harry Lauder puts it, we were just talkin' and speakin' to one another when all of a sudden we mounted a small hill and met up with a huge steam shovel which was cavorting around in a most menacing manner. That steam shovel looked about as big as the Tioga hotel. We might have dodged the shovel all right, but a member of the highway crew came running toward us waving his arms. We had already stopped to take a survey of the situation. The man said, "Back your car down that hill and wait!" meaning the hill we had just negotiated. We got out of the car and said to the highway workman, "Brother, if you want that car backed down that hill, you'll have to do it yourself. We're rather new at driving and thought we did pretty well to get up the hill. Rather than take a chance on backing it down we would prefer to mix it with the steam shovel." The man grinned and hopped in our car and backed it down, and everything was happy and friendly. When the big steam shovel got through swinging its tonneau around the fellow gave us the high sign and we traveled onward and upward.

We don't know who that highway workman is, but we're in favor of his promotion.

Asserted Gasoline Thieves Arrested in Chase Over Desert

SAN BERNARDINO—Accused of the theft of 20 gallons of gasoline from a crew of the State Highway Commission at Cronese Valley, along the Arrowhead trail, Elix Weigh, 19, and William Cherepkai, 18, were brought to the county jail yesterday from Yermo by Constable Tom Williams under sentence of 180 days.

The arrest of Weigh and Cherepkai followed a chase of over 30 miles across the desert by members of the State Highway crew. In addition to stealing gasoline Weigh and Cherepkai are asserted to have disabled the gas lines of tractors used in road work and caused a two-day layoff of the road crew while the machinery was being repaired.

Bayshore Highway Construction Proves Gigantic Project

THE BAYSHORE HIGHWAY, between San Francisco and South San Francisco, three and one-half miles under contract to H. W. Rohl for grading and surfacing, is progressing rapidly.

The main feature of this contract is the grading which, due to heavy slides, involves the excavation of nearly a million cubic yards of material. The new road cuts through two hills, the larger one with a maximum center line cut of 86 feet, and involves a long fill across the marsh adjacent to the Guadalupe Canal. This fill has proved to be a difficult piece of work as it is over a great depth of soft mud, the eroded material from the hills. The heavy fill displacing the mud, as anticipated, causes movement, often 400 to 500 feet away from the roadbed. During this work, the existing highway was displaced and tipped so that it lay at an angle, with one end elevated at least seven feet. The Spring Valley Water Company's pipe, placed on piles, was moved over a foot out of line, and much remedial work was necessary, dragging out surplus mud and building roads and counter weight fills.

One surprising feature is that the movement of the mud displaced by the fill often did not show for a considerable distance, in some cases, moving under the existing road, several hundred feet away, before showing on the surface of the marsh.

The cuts have been opened, the first hill at Visitation Point having been roughly finished, and the heavy cut at Sierra Point is well started.

A reinforced concrete subway, 123 feet long, 20 feet clear width and 22 feet six inches clear height, for use of a Southern Pacific Railroad spur track, has been completed. A massive rubble masonry wall on a concrete base has been built to protect the highway from a slide at the same time protecting a section of a forty-four-inch water main. The wall involved the placing of 2700 cubic yards of rubble masonry, 480 cubic yards of Class "A" concrete and 1250 cubic yards of Class "C" concrete.

The traffic has been well taken care of under the circumstances and few complaints have been received despite the fact that this road is very heavily traveled by both commercial and passenger cars.

Feather River Road Work Described by Convict Worker

[The following article was written by one of the prisoners assigned to this work.]

GRADE WORK on the Feather River Highway, in Butte County, under the supervision of Mr. Ed Rawson and a corps of experienced subforemen, is showing marked progress. Already nearly three miles of actual grade work is in evidence. Much rock wall and culvert work is completed. At one station on this stretch of new highway there has been constructed one of the largest concrete arch culverts in the state. This structure is located near the mouth of the historic Potter's Ravine, and just above where it empties into the beautiful Feather River. Two gas shovels of large capacity are digging their way through mountains of dirt and hard rock, and are keeping a fleet of iron mules (tractors) and dump trucks busy hauling the surplus dirt and rock to locations where filling is necessary.

Actual grade work on this piece of highway started about the 15th of July, 1928. The camp, a new one of all wood structure, is conveniently located and has accommodations for 150 men. Known as Camp No. 17, at Oroville, California, it is one of a number of day labor camps that are now operating throughout the state, under the jurisdiction of the Department of Public Works, Division of Highways, State of California, and employing convict labor. At present there are in this one camp 100 convicts working.

This new stretch of road that runs parallel with the beautiful Feather River for miles, is marked by nature's green mansions, historical monuments, entrancing views of mountains and valley, including the beauties of the country for miles around.

This artery will connect with the Forest Highway from Quincy to the Nevada state line, leading to Reno and eastern points, and will be a delight to the thousands of motorists who will use this mountain road on their way to and from many of America's attractions.

The remainder of the Bayshore Highway to San Mateo is open to travel and is an ideal stretch of level highway with an excellent oil macadam surface.

HIGHWAY DEVELOPMENT IN INYO COUNTY

(Continued from page 3.)

fourths to one gallon of "medium" oil, the quantity being gauged by the varying thickness of the surface.

The foregoing treats of oil processing done under specific maintenance, as applied to treatment of surfacing materials of crushed rock, decomposed granite and volcanic cinders, in many cases the subgrade being treated without any preparation, and does not include Diaz Lake-Alabama Gate, and Big Pine-Tin-nemaha contracts, aggregating 18½ miles of standard construction of a rock base with a 3-inch top course of oil mix.

It is worthy of note that there was no opportunity for the proper grading for an oil mix and the requirements of the laboratory were observed only so far as the grading could be corrected from such materials as were immediately at hand.

The stretch of 10 miles of volcanic cinders north from Independence was surfaced in 1924. A clay binder was used which disappeared in dust, resulting in a loose, dusty, apparently wornout surface impossible to maintain. The penetration treatment of 1926 disappeared in the course of a season and it is a remarkable coincidence that in 1927 the laboratory test revealed an ideal grading for the oil mix. It may be added that this stretch is conceded by engineers familiar with the results of the road mix to compare favorably with the best of the oiled roads throughout the state. The fact that a shallow course of oil mix averaging possible 3 inches of light porous volcanic cinders on a sand subgrade can withstand heavy trucking at a maintenance cost so low as to be negligible should be a not unworthy chapter in the results of oil treated roads.

In the foregoing recital of the results of "hit or miss" methods, no challenge to the precepts of the Materials and Research Department is intended. Satisfactory results are often thus obtained and why should this be altogether strange? Contentions relative to methods of construction, specifications, materials, etc., are no less in accord with the theories of today than they were with the theories of yesterday. Engineers are divided in opinions; one class ignoring established principles, while another maintains that the fundamentals are sacred and must be respected.

In addition to the surfacing improvements were radical alignment changes and relocation, the construction of a steel bridge by the city of Los Angeles over its aqueduct near Georges Creek, and a reinforced concrete span across a spillway of the aqueduct at the Alabama Gate, constructed jointly by the State and the city of Los Angeles.

Thus have convenient transportation facilities been afforded the towns of Lone Pine, Independence, the county seat of Inyo County, Big Pine and Bishop; highway improvements which have a tendency to a better understanding of the citizenship of the valley with each other with corresponding closer relation-

ship in both social and business life. The oiled surfaced main streets traversed by the state highway insures added civic pride as evidenced by the activity of the residents of Lone Pine, who, with the cooperation of the board of supervisors and the city of Los Angeles have kept pace with the state by extending the oiled surface to the sidewalk curb at the same time installing a modern electrolux system of street lighting.

Owens Valley, the gateway to "East of the High Sierras," a most alluring empire of the "open spaces" has been served, to be followed by intensive maintenance and also by construction refinements from time to time as warranted by travel conditions, a policy of stage construction still recognized as being sound and economic.

Contracts are being advertised as rapidly as the conclusion of preliminaries will permit of, for oiled surfaced roads of standard width on permanent location south continuously from Lone Pine and northerly from Mojave.

Day by day the trip to the high Sierras is made with greater ease and comfort to soul, body and ear, and the dreams of its patient people of the ultimate discovery by the outside world of this, the Switzerland of America, is fast becoming a reality.

TOLL BRIDGE REPORT SUBMITTED TO LEGISLATURE

(Continued from page 6.)

owned and operated by the California-Arizona Bridge Company, crossing the Colorado River about 3½ miles east of Blythe in Riverside County, and known as the Ehrenberg Bridge; a bridge now being constructed across San Francisco Bay between San Mateo and Hayward by the San Francisco Toll Bridge Company and which is to be known as the San Mateo-Hayward Bridge. A complete report on the promotion, financing, type of structure, construction and operation of the structures is made. All these bridges with the exception of the Ehrenberg Bridge are located in the vicinity of San Francisco Bay.

In addition proposed toll structures are which franchises have been asked are listed. These include:

Bridge across San Pablo Bay, from a point near Richmond to a point near San Rafael; O. H. Klatt, franchise applicant.

Bridge crossing San Francisco Bay from a point opposite Albany in Alameda County to a point near Tiburon in Marin County; franchise granted to T. A. Tomasini by Alameda County.

Thirty-nine applications to bridge San Francisco Bay from San Francisco to some point in the East Bay cities.

Applications to bridge the Golden Gate.

Effort to secure a franchise for a toll bridge across San Diego Bay from San Diego to Coronado.

The report analyzes these various proposed projects. The conclusion is expressed that the San Francisco Bay Bridge from San Francisco to Alameda is feasible only if publicly financed and constructed.

A Houston, Texas, sign painter says our danger signs are based upon a wrong psychology.

Tell a man to "Stop, Look, Listen," and he is impelled to do none of the three. He suggests the following signs for railroad crossings:

"Come ahead. You're unimportant."

"Try our engines. They satisfy."

"Don't stop. Nobody will miss you."

"Take a chance. You get hit by a train only once."

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

B. B. MEEK.....Director
GEORGE C. MANSFIELD.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

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DIVISION OF HIGHWAYS DEPARTMENT OF PUBLIC WORKS STATE OF CALIFORNIA

C. C. YOUNG, Governor

B. B. MEEK, Director, Department of Public Works
CORNING DE SAULES, Deputy Director, Department of Public Works

C. C. CARLETON, Chief of Division of Contracts and Rights of Way

GEORGE C. MANSFIELD, Editor, California Highways and Public Works

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FRED S. MOODY, Commissioner, 640 Kohl Bldg., San Francisco

C. H. PURCELL, State Highway Engineer, Sacramento

HARRY A. ENCELL, Attorney, San Francisco

E. FORREST MITCHELL, Secretary

HEADQUARTERS STAFF, SACRAMENTO

G. T. MCCOY, Administrative Assistant

L. V. CAMPBELL, Office Engineer

T. E. STANTON, Materials and Research Engineer

FRED J. GRUMM, Engineer of Surveys and Plans

C. S. POPE, Construction Engineer

T. H. DENNIS, Maintenance Engineer

CHAS. E. ANDREW, Bridge Engineer

R. H. STALNAKER, Equipment Engineer

E. R. HIGGINS, Chief Accountant

DISTRICT ENGINEERS

CHARLES H. WHITMORE, District I, Eureka

H. S. COMLY, District II, Redding

F. W. HASELWOOD, District III, Sacramento

J. H. SKEGGS, District IV, San Francisco

L. H. GIBSON, District V, San Luis Obispo

E. E. WALLACE, District VI, Fresno

S. V. CORTELYOU, District VII, Los Angeles

E. Q. SULLIVAN, District VIII, San Bernardino

F. G. SOMNER, District IX, Bishop

R. E. PIERCE, District X, Sacramento

General Headquarters, Third Floor, Highway Building, Eleventh and P Streets, Sacramento, California

World Engineers Are to Study U. S. Highways

Highways representatives from all parts of the world are coming to the United States in 1930 to study methods of road construction in this country, the Chief of the Bureau of Public Roads, Thomas H. MacDonald states.

Mr. MacDonald has returned from Europe where he attended the meeting of the International Road Commission at Paris as the American representative. He explained that the wide diversity of climatic and soil conditions in the United States with the varied distribution of wealth and population approximated the fundamental problems of highway construction found in all sections of Europe.

The full text of Mr. MacDonald's statement follows:

The great distinction which exists between our program and that of other nations is that, while here the whole country has adopted motor transportation, elsewhere car use is still largely in the hands of a few.

The rapid expansion in the United States faced our engineers with an urgent demand for the immediate improvement of hundreds of thousands of miles of highway. At the same time, increased valuations growing out of bettered transportation facilities and a moderate tax upon the vehicle itself made it actually cheaper for the public to have roads than to go without them, so we were able to embark upon a construction program without parallel in the history of public works without dislocating our financial system.

Concurrently we were faced with the question of whether it was cheaper to build these roads slowly and laboriously by human labor, as most other countries now do, or whether we should work out mass production methods and so meet the national demand quickly. Experience has demonstrated that the latter plan is by far the more efficient and less costly.

Foreign highway engineers, who are as well versed as our own men in the technique of road building, or are better versed, are, in the main, only now arriving at the stage where they must meet similar problems in their own countries; hence their interest in the sessions here in 1930.

Further, because of the wide diversity of geographical, climatic, and soil, conditions in the United States, coupled with varying degrees of wealth and population, it is possible to approximate here the basic problems which confront engineers from abroad, whether they are interested in congested areas, such as England has, in primary roads, such as are needed in the newer countries, or in questions of mountain roads, such as those faced by Austria, Switzerland, and other nations.

So the United States in 1930 will be a giant laboratory in highway development and motor transportation where highway officials from other countries will find an opportunity to see not only what has been accomplished from an engineering point of view but also to observe the social and economic influences of our good roads.

Bridge Strength Is Determined By Actual Tests

AT THE SUGGESTION of the Bureau of Public Roads and the North Carolina Highway Department, engineers at last tested their mathematically proved theories of the maximum strength of a bridge by cracking the concrete of one by means of heavy loads in that state, according to a statement made public November 8 by the Department of Agriculture. The statement follows in full text:

Before the recent tests of a concrete arch bridge over the Yadkin River in North Carolina, engineers designing such structures were compelled to rely on theory alone for their assumptions as to the stresses produced by the expected loads. No full-sized bridge of the arch type had ever been tested to determine its maximum strength, either in this country or, so far as is known, anywhere in the world.

The theory—an extremely intricate one, intelligible only to those versed in higher mathematics—was known to be safe. That was demonstrated by the fact that bridges built in accordance with it have not failed. But whether it was too safe, whether the bridges were stronger and more expensive than necessary—that question had never been answered.

To answer it engineers have long looked forward to the opportunity that would give them a real life-sized bridge to test to destruction, and the opportunity came in 1927, when it was learned that a dam, then building on the Yadkin River, would eventually submerge the existing arch bridge on the road between Albemarle and Mt. Gilead, N. C., and necessitate its abandonment and the construction of a new bridge 30 feet higher.

The existing bridge, a beautiful modern structure, was completed in 1922 by the North Carolina Highway Department with the assistance of the Federal Government. Here was the long awaited opportunity and the engineers were not slow in taking advantage of it. At the suggestion of the North Carolina Department and the Bureau of Public Roads of the United States Department of Agriculture, an advisory committee was formed of members of technical societies and schools to propose plans and methods of procedure. The tests were made by five engineers, three from the Bureau of Public Roads and two from the State Highway Department.

The bridge was about a quarter of a mile long, of 17 spans, three of which were 146 feet in length, the others being concrete girder approach spans. Under the arch of one of the 146-foot spans, a scaffold was erected upon which the engineers, with their instruments, took their measurements. Onto the floor of the bridge were rolled two huge water tanks, each about the size of a small two-story house or semibungalow, and weighing $23\frac{1}{2}$ tons. Water was pumped into them until the maximum weight of 160 tons each was reached, the engineers taking measurements under the span of the effect on concrete of weights. Then the tanks were emptied, shifted to other positions on the floor of the bridge, and subjected to the same procedure. Thus the actual stresses in different parts of the span were measured.

AT THE DONNER SUMMIT



Just One of the Problems of the Maintenance Department.

Although the bridge did not collapse under even the heaviest load, it did develop some serious cracks which would have made it dangerous for traffic.

The Division of Tests and Research of the Bureau of Public Roads is compiling the test data and a technical report on the findings, to aid in the future development of reinforced concrete arch bridges.

Here lies the body of Samuel Crane
Who ran a race with a speeding train.
He reached the track, got near across,
But Sam and his car were a total loss.
The sexton softly tolled his knell,
Speeding Sam on his way to—well,
If he'd only stopped to look and listen
He'd be livin' now instead of missin'.

—Dallas Hurry Back News.

My Grandpa notes the world's worn cogs,
And says we're going to the dogs.
His Grandpa, in his house of logs,
Said things were going to the dogs.
His Grandpa, in the Flemish bogs,
Said things were going to the dogs.
His Grandpa, in his hairy togs,
Said things were going to the dogs.
But this is what I wish to state:
THE DOGS HAVE HAD AN AWFUL
WAIT!!

—Exchange.

The celebrated soprano was doing a solo when Bobbie said to his mother, referring to the conductor of the orchestra:

"Why does that man hit at that woman with his stick?"

"He's not hitting at her," replied the mother. "Keep quiet."

"Well, then, what's she hollerin' for?"—Answers.

Young Lady Motorist—"It's snowing and sleeting and I'd like to buy some chains for my tires."

"I'm sorry—we keep only groceries."

"How annoying! I understood this was a chain store."—Judge.

State Highway Progress Report; Budget Tells Construction Program

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IN ORDER THAT A COMPLETE PICTURE of the State Highway System might be available, the following data was compiled by C. H. Purcell, State Highway Engineer, for transmission to Governor C. C. Young and B. B. Meek, Director of the Department of Public Works. The statement gives general facts regarding the different routes in the state highway system, the extent of their present improvement, work undertaken during the present biennium (1927-1929) and either completed or under way, together with a summary of improvements included in the budget for the construction program of the 1929-1931 biennium, and a list of the particular projects comprising that program. The statement follows:

SAN FRANCISCO TO OREGON LINE NEAR MONUMENTAL

(The Redwood Highway)

General Facts

Length of highway—409 miles.

Daily Travel (Summer)—South of Petaluma, 12,000 vehicles; Healdsburg, 4000; Willits, 1200; Eureka, 4000; Crescent City Junction, 1000; State line, 600.

Condition of Roads at Close of Present Biennium (June 30, 1929)

Distance Paved—130 miles.

Improved with Dustless, Oiled Surface—271 miles.

Surfaced with Gravel—8 miles.

Improvements Included in Budget for Construction Program for 1929-1931 Biennium

Pavement—58 miles (bringing total pavement on highway to 188 miles).

Widening and Repavement—15 miles.

Grading and Surfacing—The remaining 221 miles has all been graded to some extent and surfaced. Grading work in recent years has been of a standard to permit of paving as the next step. The earlier jobs, however, must be regarded before further improvements in the surface is warranted. Twenty miles of this latter type will be graded and surfaced during the biennium.

Bridges—5 major bridges will be replaced, and one major structure repaired.

Grade Separations—5 grade separations will be affected.

Realignment—2.3 miles will be relocated to eliminate objectionable features of the present location. This will be graded and surfaced to standard alignment and width and a 4.4-mile section now being graded will be surfaced.

LIST OF PROJECTS IN 1929-1931 BUDGET

DEL NORTE COUNTY—South boundary to Willson Creek, 12.8 miles, paving, \$110,900; Hardscrabble Creek, bridge and grading, \$18,200; Elk Valley to Smith River, 4 miles, paving, \$35,000.

HUMBOLDT COUNTY—Orick to north boundary, 15 miles, paving, \$130,000; Fortuna to Loleta, 4.1 miles, paving, \$165,000; at North Scotia bridge, 0.2 miles, paving, \$10,000; Arcata to Trinidad, 14.5 miles, paving, \$151,000; north of Big Lagoon, 2.5 miles, pav-

ing, \$31,000; Loleta to Beatrice, 3.8 miles, paving and structure, \$150,000; Fish Creek to Meranda, 3.2 miles, grading and surfacing, \$200,000; Eureka Slough, bridge repair, \$55,000; Garberville to Redway Bluff, 2 miles, grading and surfacing, \$110,000; Hartsooks to Richardson Grove, 0.5 miles, grading and surfacing, \$61,000; south of Eureka, 0.6 miles, paving, \$15,000; Eel River at Dyerville, bridge repair, \$28,800.

SONOMA COUNTY—At Lytton overhead, 0.2 miles, paving, \$15,000.

MARIN COUNTY—Near Greenbrae, grade separation, \$18,000; near Schuetzen Park, grade separation, \$150,000; San Rafael northerly, 2.1 miles, grading and paving, \$219,200; Sausalito to Alto, grading and surfacing, \$400,000; Alto to San Rafael, surfacing, \$100,000; Corte Madera Creek at Greenbrae, bridge, \$125,000.

MENDOCINO COUNTY—Heagneys to Red Mountain Creek, 6 miles, grading and surfacing, \$110,000.

SONOMA-MARIN COUNTIES—Petaluma to Ignacio, 12.2 miles, grading and paving, \$604,800; San Antonio Creek, bridge, \$38,000.

SAN FRANCISCO TO SAN DIEGO

(The Coast Route)

General Facts

Distance—489 miles of state highway.

Travel—This road carries the heaviest traffic of the through routes of the state. The summer count at San Mateo was 29,000 vehicles per 16-hour day; north of Gilroy, 8500; south of Salinas, 4000; San Luis Obispo, 3200; south of Santa Barbara, 6500; Ventura, 8000; Los Angeles, 22,400; Anaheim, 15,000; Del Mar, 8000.

Present Conditions

Pavement—The entire route is paved, but much of the work was done before traffic demands were heavy, and there still remains a considerable mileage of narrow pavement on inferior alignment.

Improvements Recommended in the Budget for Construction Program of 1929-1931 Biennium

Pavement—73 miles of present narrow pavement to be paved to present standards. This will leave about 107 miles to be widened or graded to standard as the case may be.

Grade Separations—One grade separation will be made and two overhead structures improved.

Bridges—7 bridges will be rebuilt.

Borders—64 miles of hard rock border will be placed along road.

LIST OF PROJECTS IN 1929-1931 BUDGET SAN FRANCISCO TO SAN DIEGO

SANTA CLARA COUNTY—In San Jose, Mulia and Alameda, grade separations, \$75,000; Palo Alto to Butchers corner, 9.5 miles, grading and paving, \$514,400.

MONTEREY COUNTY—Salinas River near Ardo, bridge and grading, \$295,000; Salinas River near Bradley, bridge and grading, \$245,000; Salinas to Chualar, 9.7 miles, grading and paving, \$335,000; south of San Ardo, 0.6 miles, grading and surfacing, \$38,000.

SAN MATEO-SANTA CLARA COUNTIES—San Francisco Creek, bridge, \$20,000.

SAN MATEO COUNTY—At Colma, grade separation, \$60,000.

SAN LUIS OBISPO COUNTY—Santa Maria River to Arroyo Grande, 12 miles, grading and paving, \$582,500; Paso Robles to Atascadero, 10 miles, grading and paving, \$350,000; Graves Creek, bridge, \$12,000; San Luis Obispo to Cuesta grade, 3.1 miles, grading and paving, \$145,000.

SANTA BARBARA COUNTY—In Gaviota Canyon, 3 miles, grading and paving, \$219,500; Gaviota Creek, bridge, \$38,000; Wigmore to Zaca, 4.3 miles, grading and paving, \$200,000; near Nojoqui Creek, 0.3 mile, grading and surfacing, \$23,000; Nojoqui Creek, bridge, \$27,000.

ORANGE COUNTY—North of Serra, 0.5 miles, grading and paving, \$40,000; near Galivan, 1 mile, paving, \$50,000; along Serra Bluffs, drainage, \$35,000.

LOS ANGELES COUNTY—Sepulveda Boulevard to Calabasas, 10.5 miles, paving, \$150,000; near Whittier, grade separation, \$75,000.

VENTURA-LOS ANGELES-ORANGE-SAN DIEGO COUNTIES—(State Highway Routes 2 and 4)—Oil Rock border, 85 miles, \$171,000.

VENTURA COUNTY—Conejo Grade, grading, \$60,000; Camarillo to Conejo Creek, 2.3 miles, grading and paving, \$40,000.

SAN DIEGO COUNTY—San Mateo Flat, 0.6 miles, paving, \$55,000; San Luis Rey River at Oceanside, bridge and grading, \$405,000.

VENTURA-LOS ANGELES-ORANGE AND SAN DIEGO COUNTIES—This road participates with State Highway Routes 9 and 60 in cooperative projects—Grading, paving, bridges, and grade separations, \$1,086,349.71.

SACRAMENTO TO OREGON LINE VIA MARYSVILLE

(The Pacific Highway)

General Facts

Distance—384 miles.

Travel (Summer)—Sacramento, 13,000 vehicles per day; north of Roseville, 2400; south of Marysville, 3300; Oroville Wye, 1300; Chico, 3000; north of Redding, 2600; Dunsmuir, 2100; Gazelle, 1800; State Line, 1600.

Condition of Road at End of Present Biennium (June 30, 1929)

Pavement—On July 1, 1929, all of this road will be paved except 78 miles, which is oil surfaced and 18.6 miles which has been recently graded and surfaced.

Improvements Included in Budget for Construction Program for 1929-1931 Biennium

Pavement—7.7 miles of new pavement to be laid.

Thickening and Widening—11.3 miles.

Grading and Surfacing—8.5 miles. (This will bring the route up to standard grading except for 2 miles on the section from the Klamath River to the Oregon line, which still remains to be graded. There will be 87 miles ready to be paved as funds permit.) The 18.6 miles recently surfaced will be oil treated to provide a satisfactory surface for traffic.

Bridges—8 bridges will be replaced and one new structure built.

Subways—The situation at the Cottonwood subway will be improved to eliminate delay to traffic during flood periods.

LIST OF PROJECTS IN 1929-1931 BUDGET SACRAMENTO TO OREGON LINE VIA MARYSVILLE

SISKIYOU COUNTY—In Shasta Canyon, bridges, \$165,000; Klamath River, bridge, \$82,000; Shasta River to Gazelle, 7.7 miles, paving, \$278,000; at Spring Hill, 0.6 miles, paving, \$15,000; Yreka to Klamath River, 8.5 miles, grading and surfacing, \$662,524.65; Shasta River to Gazelle, 7.7 miles, grading and drainage, \$77,000.

SACRAMENTO COUNTY—Ben Ali to Sylvan School, 8.1 miles, grading and paving, \$430,000; Arcade Creek, bridge, \$14,000.

PLACER COUNTY—Through Lincoln, 1.6 miles, grading and paving, \$77,000; Cook Creek Overflow, bridge, \$8,500.

YUBA COUNTY—Through Wheatland, 1 mile, grading and paving, \$40,000.

TEHAMA-SHASTA COUNTIES—At Cottonwood, bridge and grade separation, \$122,000.

SHASTA COUNTY—Mears Creek, bridge, \$20,000; La Moine to north boundary, 18.6 miles, surfacing, \$26,040.

SACRAMENTO TO LOS ANGELES

(The Golden State Highway—Valley Route)

General Facts

Distance—371 miles. (State highway mileage.)

Travel (Summer)—Sacramento, 7000 vehicles per day; Modesto, 7500; Merced, 5500; south of Fresno, 8400; Tulare, 3000; south of Bakersfield, 8200; Maricopa Road, 2500; south of Junction with Mojave Road, 8200.

Condition of Road at End of Present Biennium (June 30, 1929)

Pavement—The road is paved throughout, though much of the early pavement is too narrow for present traffic. Reconstruction now underway as authorized during the present biennium will reduce the pavement requiring widening to about 120 miles by July 1, 1929.

Improvements Included in Budget for Construction Program for 1929-1931 Biennium

Reconstruction—68 miles.
 New Location—8.9 miles (To relieve Newhall Tunnel section).
 Bridges—9 new bridges to be built.
 Grade Separation—One.
 Shoulder Improvement—21 miles.
 Widening—Program of widening on Ridge route to be continued.

LIST OF PROJECTS IN 1929-1931 BUDGET

MERCED COUNTY—Bear Creek, bridge and grade separation, \$62,000.

FRESNO COUNTY—At Calwa, grade separation, \$70,000; Fresno to south of Fowler, 10 miles, grading and paving, \$380,000.

SACRAMENTO COUNTY—Arno to McConnell, 3.2 miles, grading and paving, \$212,000; Cosumnes River and overflow, bridge, \$125,000.

SAN JOAQUIN COUNTY—Calaveras River to Huston School, 12.3 miles, grading and paving, \$340,000; Forest Lake to north boundary, 1.4 miles, grading and paving, \$61,500; Mosher, Bear and Live Oak creeks, bridges, \$40,000; Calaveras River, bridge, \$14,000; Mokelumne River, bridge, \$78,000; north of Turner Station, 0.8 of a mile, grading and surfacing, \$41,700; north of Turner Station, bridge, \$15,000; Huston School to Forest Lake, shoulders, \$69,000.

LOS ANGELES COUNTY—Tunnel Station to Santa Clara River, 8.9 miles, paving, \$175,000; north of Newhall Tunnel, 1 mile, grading and paving, \$60,000; Ridge route, grading and surfacing, \$220,000; Castaie School, northerly, 3.8 miles, paving, \$60,000; Castaie, northerly 1 mile, grading and paving, \$25,000.

MADERA COUNTY—At Berenda to north boundary, 10 miles, grading and paving, \$370,000; Cottonwood Creek, bridge, \$28,000.

TULARE COUNTY—South boundary to Tipton, 20.9 miles, grading and paving, \$688,000.

STOCKTON TO SANTA CRUZ VIA OAKLAND
 (The Altamont Road)

General Facts

Distance—118 miles.
 Travel (Summer)—Mosssdale, 5300 vehicles; Altamont, 6000; Dublin, 7600; south of Hayward, 8300; Mission San Jose, 5600; north of Mission San Jose, 9900; west of San Jose, 11,000; at Santa Cruz County line, 9700; Santa Cruz, 8200.

Condition of Road at End of Present Biennium
 (June 30, 1929)

Pavement—The road is paved throughout, and is gradually being improved to a high standard.

Work Planned in Budget for Construction Program for 1929-1931 Biennium

Pavement—By June 30, 1931, the work of bringing road to a higher standard of pavement improvements will be practically completed to San Jose, leaving only the distance of 32 miles between San Jose and Santa Cruz a 15-foot pavement.

Relocation—A portion of the Valley route (Stockton to French Camp) is to be abandoned and the Stockton to Santa Cruz road is to be extended from French Camp into Stockton. This will provide a more convenient entrance and eliminate the present road, which is on a high fill.

Grading and Surfacing—To provide the above connection 2.9 miles of road will be graded and surfaced.

Bridges—The new connection will also necessitate the construction of two new bridges between French Camp and McKinley avenue; two other bridges to be replaced, one of which will be widened.

Paving—14.6 miles of pavement will be widened and thickened.

LIST OF PROJECTS IN 1929-1931 BUDGET

SAN JOAQUIN COUNTY—Banta to Mossdale, 3.2 miles, grading and paving, \$155,000; Tom Paynes Slough, bridge, \$12,000; French Camp to Stockton, 2.9 miles, grading and paving, \$73,500; near French Camp, bridges, \$30,000; near Banta, 1.9 miles, grading and paving, \$69,500.

ALAMEDA COUNTY—Hayward to Niles, 8 miles, grading and paving, \$398,600.

SANTA CLARA COUNTY—Coyote Creek to San Jose, 1.5 miles, paving, \$80,000; Coyote Creek, bridge, \$55,000.

SACRAMENTO TO WOODLAND JUNCTION

General Facts

Distance—15 miles.
 Travel (Summer)—West of Sacramento, 6000; Davis, 4800; Woodland "Y," 4900.

Improvements Undertaken During the Present Biennium (1927-1929)

Grading and Resurfacing—3 miles completed by July, 1929.

Widening and Drainage Betterments—Cooperative improvements completed in Davis for widening pavement and caring for drainage.

Future Work—The above improvements have taken care of immediate necessary corrections in grade and drainage. Further widening of pavement can be deferred for several years until traffic has materially increased.

BENICIA VIA WEST SIDE OF THE SACRAMENTO VALLEY TO RED BLUFF

(The Pacific Highway)

General Facts

Distance—156 miles.
 Travel (Summer)—Cordelia Junction, 5700 vehicles a day; Dixon, 4400; north of the Woodland Wye, 2600; Williams, 1600; Red Bluff, 1700.

Work Included in Budget for Construction Program for 1929-1931 Biennium

Bridges—4 county constructed bridges to be rebuilt and widened.

Pavement—5.1 miles of pavement will be laid on section recently graded.

Widening—10.7 miles of the present 15-foot pavement will be widened and protected by oil rock shoulders, which will later serve as a base when the pavement is thickened.

Grading—8 miles where present 15-foot pavement has failed under poor rut grade and drainage conditions, to have grade raised.

LIST OF PROJECTS IN 1929-1931 BUDGET

GLENN COUNTY—Logandale to Willows, 5.1 miles, paving, \$200,000.

COLUSA COUNTY—Hershey to Berlin, 10.7 miles, shoulders, \$42,800; Williams, northerly, 8 miles, grading and surfacing, \$200,000.

SOLANO COUNTY—Dixon to Vacaville, bridges, \$16,000.

IGNACIO TO CORDELIA VIA NAPA

(The Napa Lateral)

General Facts

Distance—38 miles.

Travel (Summer)—Schellville, 2100 vehicles per day; Napa Junction, 6900; Cordelia Junction, 5100.

Improvements Included in Budget for Construction Program for 1929-1931 Biennium

Widening and Surfacing—3.2 miles of present 15-foot pavement to be surfaced and widened to 20 feet.

Bridges—One bridge to be repaired and deck replaced.

LIST OF PROJECTS IN 1929-1931 BUDGET

NAPA COUNTY—Greenwood corner to east boundary, 3.2 miles, grading and paving, \$125,000.

MARIN COUNTY—Petaluma Creek, bridge repair, \$35,000.

SAN FERNANDO TO SAN BERNARDINO

General Facts

Distance—57 miles.

Travel (Summer)—Tujunga, 6100 vehicles; La Canada, 7200; Azusa, 10,600; east of Uplands, 4900; San Bernardino, 5400.

Present Condition—All paved.

Improvements Included in Budget of Construction Program for 1929-1931 Biennium

Grading and Paving—12.1 miles (cooperative projects).

Bridges—One bridge to be widened to 42-foot roadway with sidewalk added; another bridge to be widened.

Grade Crossings—One grade crossing to be eliminated by overhead structure (cooperative project).

Widening and Paving—1.5 miles (pavement to be 30 feet in width).

LIST OF PROJECTS IN 1929-1931 BUDGET

LOS ANGELES COUNTY—Azusa to Glendora, 1.5 miles, grading and paving, \$75,000; San Gabriel River, bridge, \$170,000. This route shares with routes 2 and 60 in an allotment of \$1,086,394.71 cooperative projects for grading, paving, bridges, and grade separations.

SAN BERNARDINO COUNTY—Near Malaga, grade separation, \$75,000; Lytle Creek, bridge, \$65,000.

VENTURA-LOS ANGELES-ORANGE AND SAN DIEGO COUNTIES—This road participates with State Highway Routes 2 and 60 in certain cooperative projects—Grading, paving, bridges, and grade separations, \$1,086,349.71.

SAN LUCAS TO SEQUOIA NATIONAL PARK

General Facts

Distance—147 miles.

Travel (Summer)—San Lucas, south of city, 110; Coalinga, south of city, 383; Oil Fields, at Oil Kings Pool, 400; Hanford, west of city, 1600; Goshen Junction, 1700; east of Visalia, 1500; east, Three Rivers, 1400.

Present Condition of Road—92 miles pavement; 7 miles oiled road; 11 miles gravel, as July 1928. Balance, earth road.

Improvement Undertaken During the Present Biennium (1927-1929)

Widening and Surfacing—During the present biennium widening and surfacing of the Monterey Grade in Monterey County has been completed.

Oiling—12.3 miles to be oiled during the early part of 1929.

SALIDA TO JUNCTION ROUTE 23

(Sonora Road)

General Facts

Distance—132 miles.

Traffic (Summer)—East of McHenry Road, 2200 vehicles per 16-hour day; west of Oakdale, 1500; south of Sonora, 2300; each of Confidence, 800.

Condition of Road at the End of the Present Biennium (June 30, 1929)

Pavement—48 miles.

Oiled Surfacing—9 miles.

Rock Surfacing—12 miles.

Unimproved—63 miles.

Improvements Included in the Budget for Construction Program for 1929-1931 Biennium

An 11.8-mile section which was graded and surfaced by the Bureau of Public Roads, will be oil treated.

LIST OF PROJECTS IN 1929-1931 BUDGET

CALAVERAS-TUOLUMNE COUNTIES—An allotment of \$43,680 has been made for surfacing 27 miles on this route and Route 24.

SACRAMENTO TO NEVADA LINE VIA PLACERVILLE

General Facts

Distance—107 miles.

Travel (Summer)—East of Sacramento, 4300 vehicles per 16-hour day; El Dorado, 1200; east of Placerville, 2000; east of Riverton, 1100; west of Meyers, 550; at Lakeside, 200.

Condition of Road at End of Present Biennium (June 30, 1929)

Pavement—49 miles.

Graded with Oil Rock Mix Surface—18 miles.

Unsurfaced—40 miles.

Improvements Included in Budget for Construction Program for 1929-1931 Biennium

Grading—Portions of 8.6 miles (cooperative projects).

Surfacing—4.2 miles (cooperative project).

Relocation, Grading and Surfacing—Present county road to be abandoned for distance of eight miles, new section 5.25 miles in length to be graded and surfaced.

Bridges—3 new bridges to be built.

LIST OF PROJECTS IN 1929-1931 BUDGET

EL DORADO COUNTY—Riverton to Kyburz, 8.6 miles, grading and surfacing, \$150,000; American River at Riverton, bridge, \$20,000; Strawberry to Phillips, 4.2 miles, surfacing, \$25,000; Mays to state line, 5.2 miles, grading and surfacing, \$50,000; Trout Creek and Upper Truckee River, bridges, \$20,000.

SAN DIEGO TO EL CENTRO*General Facts*

Distance—114 miles.

Travel (Summer)—West of El Cajon, 6200 vehicles; Jacumba, 1500; El Centro, 2000.

Condition of Road at the End of the Present Biennium
(June 30, 1929)

Pavement—86 miles will be paved.

Surfacing—19 miles will be rock surfaced, of which 5.7 miles is oil treated. 9 miles will still be earth.

Improvements Included in the Budget for Construction
Program for 1929-1931 Biennium

Paving, Grading and Surfacing—31 miles to be graded and surfaced, 8 miles of which will be paved; temporary surface to be placed on balance, pending settlement of fills; alignment to be improved. Of the 3-mile section from Meyers Creek to 2.6 miles west of Coyote Wells, 2.4 miles recently graded will be paved and 0.6 miles of the present pavement widened and thickened, as will 5 miles between Dixieland and Seeley.

LIST OF PROJECTS IN 1929-1931 BUDGET

SAN DIEGO COUNTY—Viejas Valley to Tecate Divide, 31 miles, grading and paving, \$300,000.

IMPERIAL COUNTY—West of Coyote Wells, 3 miles, grading and paving, \$210,000; Dixieland to Seeley, 5 miles, paving, \$165,000.

**ROUTE 1. NEAR CALPELLA TO ROUTE 37
NEAR CISCO**

(Tahoe-Ukiah Highway)

General Facts

Distance—182 miles.

Traffic (Summer)—Upper Lake, 700 vehicles per 16-hour day; west of Williams, 400; east of Colusa, 800; east of Marysville, 1000; west of Grass Valley, 600; east of Nevada City, 300.

Condition of Road at the End of the Present Biennium
(June 30, 1929)

Pavement—26 miles.

Oiled Surface—55 miles.

Rock Surface—28 miles (12.8 miles about to be advertised).

Unimproved—73 miles (This distance will be shortened about 9 miles when final location is made).

LIST OF PROJECTS IN 1929-1931 BUDGET

From the Abbott Mine to Williams portions of the route totaling some 14.7 miles in length are to be graded and surfaced, \$300,000. This work will be on new location and will shorten the distance between these two points and eliminate portions of the old county road, part of which is now improved with a rock surface.

ALBANY TO MARTINEZ*General Facts*

Distance—23 miles.

Travel (Summer)—Albany, 22,000; Franklin Canyon, 10,700; Crockett, 2000; Martinez, 1300.

Present Condition—All paved.

Improvements Undertaken During the Present
Biennium

Bridges—Wildcat Creek Bridge built and completed. Widening—Cooperative widening of pavement

through Cerrito completed; widening of pavement through San Pablo now under way; plans and specifications are being prepared for grading and paving through Pinole and Hercules, it being planned to complete this work in the present biennium. With the completion of these projects a 30-foot or wider pavement will be provided from Oakland to the Carquinez Bridge.

HOPLAND TO LAKEPORT*General Facts*

Distance—19 miles.

Travel (Summer)—Hopland Jct. Redwood Highway, 800; South Lakeport, 1500.

All oiled.

Present Condition—The route has been graded, surfaced and oiled, and is now serving the traffic using it in a satisfactory manner.

ROSEVILLE TO NEVADA CITY*General Facts*

Distance—41 miles.

Traffic (Summer)—Roseville, 3700 vehicles per day; Auburn, 3400; Grass Valley, 1400; Nevada City, 1600.

Improvements Included in the Budget for Construction
Program for 1929-1931 Biennium

Pavement—3 miles, graded during present biennium, is to be paved.

Railroad Crossings—New subway to be built and approaches graded and surfaced.

Alignment—Alignment on portion of the road to be corrected and bettered by mile of new grading and surfacing.

LIST OF PROJECTS IN 1929-1931 BUDGET

PLACER COUNTY—At Newcastle, 0.9 mile, grading and grade separation, \$200,000; Roseville to Rocklin, 3 miles, paving, \$90,000; Wise Power House to Auburn, 1 mile, grading and surfacing, \$60,000.

MERCED TO ROUTE 40 NEAR SEQUOIA

(Yosemite All-year Lateral)

General Facts

Distance—70 miles (paved 16 miles; oil mixed surface, 39 miles; earth road, 15 miles). Contract recently awarded for grading and surfacing 7 miles of this latter section.

Travel (Summer, 16-hour count)—East of Merced, 2700 vehicles; Mormon Bar, 2400; Briceburg, 1700.

Improvements Included in Budget For Construction
Program for 1929-1931 Biennium

Grading and Surfacing—Balance of earth section (8 miles) will be graded and surfaced.

Bridges—One bridge to be replaced.

Grade Crossings—One grading to be eliminated by overpass structure (cooperative project with railroad).

Oiling—6.3-mile section now being graded and surfaced will be sealed with oil.

LIST OF PROJECTS IN 1929-1931 BUDGET

MERCED COUNTY—Bradley Overhead, grade separation, \$45,000.

MARIPOSA COUNTY—West of Cathay to Agua Fria Creek, 8 miles, grading and surfacing, \$259,600; Owens Creek, bridge, \$10,000; west boundary to Orange Hill School, 6.3 miles, surfacing, \$8,820.

WEST OF CLAREMONT TO RIVERSIDE*General Facts*

Distance—17.6 miles.

Travel (Summer count, 16-hour day)—Chino Cross Roads, 10,000 vehicles; at Los Angeles County line, 10,700; at Ontario, 3500; at Riverside, 6500.

Present Condition—The entire route is paved.

Improvements Included in Budget for 1929-1931 Construction Program

Bridges—Three narrow bridges are to be widened. Two bridges are to replace dips in the pavement.

LIST OF PROJECTS IN 1929-1931 BUDGET

SAN BERNARDINO COUNTY—Near Collins and Pomona, bridges and grading, \$39,500. Near Ontario, bridges, \$12,500.

REDDING TO ARCATA*(Trinity Lateral)**General Facts*

Distance—150 miles.

Travel—Willow Creek, 144 vehicles per day; Big Bar, 59; south of Weaverville, 122; between Redding and Tower House, 310.

Present Condition—Oil seal surface, 22 miles; rock surfaced, 33 miles; earth road, 95 miles.

Improvements Included in Budget for 1929-1931 Construction Program

Bridges—8 bridges, originally built by counties, and deemed too narrow for travel and structurally unsafe, to be replaced; a suspension bridge to be replaced by new structure located some distance upstream from present bridge; approaches to be graded and surfaced.

LIST OF PROJECTS IN 1929-1931 BUDGET

TRINITY COUNTY—North Fork Trinity River, bridge and grading, \$65,000; west of Burnt Ranch, grading, \$37,500; Trinity River at Douglas City, bridge and grading, \$98,500.

HUMBOLDT COUNTY—Redwood Creek to Three Creeks, bridges, \$96,000.

RICHVALE TO QUINCY VIA OROVILLE*(Feather River Lateral)**General Facts*

Distance—80 miles (approximately).

Travel—New route.

Present Condition—Two convict camps now at work on highway.

LIST OF PROJECTS IN 1929-1931 BUDGET

BUTTE COUNTY—Grading and Surfacing—Portions of section 8.4 miles in length from Big Bend to Pulga will be graded and surfaced; convict camp work to continue.

SAN JUAN BAUTISTA TO ROUTE 32 VIA HOLLISTER*(The Hollister Road)**General Facts*

Distance—15 miles.

Travel (Summer, 16-hour count)—At junction with Coast Route, 2600; at junction with Pacheco Pass Road, 1100.

Present Condition of Road

Pavement—10 miles.

Oil Surface—5 miles.

Improvements Included in the Construction Program for the 1929-1931 Biennium

The five miles of oil seal surface will be paved, thus providing a permanent surface for the entire route.

**LIST OF PROJECTS IN 1929-1931 BUDGET
SAN JUAN BAUTISTA TO ROUTE 32 VIA HOLLISTER**

SAN BENITO-SANTA CLARA COUNTIES—Hollister to San Felipe, 5 miles, paving, \$45,000.

**SAUGUS TO ROUTE 11 AT ALPINE JUNCTION
(The Bridgeport Road)***General Facts*

Distance—410 miles maintained as State Highway.

Travel (Summer, 16-hour count)—Saugus, 2300 vehicles; north of Mojave, 500; at Freeman Junction with the Walker Pass Road, 400; at Big Pine, 1000; north of Bishop, 1300; Markleeville, 47; Alpine Junction, 128.

Condition of the Road at the Close of the Present Biennium (June 30, 1929)

Pavement—87 miles.

Oil Mixed Surface—93 miles.

Disintegrated Granite Surface—33 miles.

Earth Road—197 miles.

From a point north of Coleville to the Ebbetts Pass Road there is no road. Travel by way of Gardnerville to Woodford or Minden to Lake Tahoe.

Improvements Included in the Construction Program for 1929-1931 Biennium

When the program for 1929-1931 biennium is completed, the route will be graded and paved or oil surfaced for approximately 250 miles.

Present graded section to be extended north about 10 miles.

LIST OF PROJECTS IN 1929-1931 BUDGET

KERN COUNTY—Cinco to 5 miles north of Ricardo, 14.2 miles, grading and surfacing, \$325,000.

KERN-INYO COUNTIES—Freeman to Narka, 20.4 miles, grading and surfacing, \$239,000.

INYO COUNTY—Narka to Little Lake, 3.5 miles, grading and surfacing, \$42,500; Coso Junction to Olancho, 21.3 miles, grading and surfacing, \$210,500.

MONO COUNTY—Grading and surfacing in Mono County, \$250,000.

ROUTE 4 NEAR LODI TO ROUTE 23 NEAR SILVER CREEK*(Ebbetts Pass Road)**General Facts*

Distance—113 miles.

Travel (Summer, 16-hour count)—Junction Valley Highway near Lodi, 950; between San Andreas and Valley Springs, 700; near Murphy's, 500.

Condition of Road at the Close of the Present Biennium (June 30, 1929)

Pavement—11 miles.

Oil Seal—34.5 miles.

Rock Surface—15.5 miles.

Earth—52 miles.

*Improvements Included in the Budget for the
Biennium of 1929-1931*

15.5 miles of rock surfacing between Murphy's and Big Trees will be oiled to conserve the material and provide suitable surface for traffic.

LIST OF PROJECTS IN 1929-1931 BUDGET

CALAVERAS AND TUOLUMNE COUNTIES—An allotment of \$43,680 has been made for surfacing projects on 27 miles of this road and Route 13.

NEVADA CITY TO DOWNIEVILLE

General Facts

Distance—46 miles.

Travel (Summer)—North Nevada City, 380; Comptonville, 290; Downieville, 127.

Present Condition—The road has been previously constructed by convict labor, and is now satisfactorily serving the traffic using it.

SAN BERNARDINO TO EL CENTRO

General Facts

Distance—151 miles.

Travel (Summer, 16-hour count)—Redlands, 3500 vehicles; Banning, 2100; Westmoreland, 1500; El Centro, 2200.

*Condition of Road at the Close of the Present
Biennium (June 30, 1929)*

Pavement—140 miles will be paved.

Oil Mix Surface—11 miles.

*Improvements Included in the Budget for the
Biennium of 1929-1931*

Pavement—10.5 miles.

Widening and Thickening—31.9 miles.

Extension of Culverts and Grading Adequate Shoulders—7.2 miles.

Protection—Provision to be made to protect highway for approximately 20 miles in length from the effects of cloud bursts is included in the set-up.

LIST OF PROJECTS IN 1929-1931 BUDGET

SAN BERNARDINO TO EL CENTRO

SAN BERNARDINO COUNTY—Mill Street to Santa Ana River, 1.8 miles, grading and paving, \$79,000.

IMPERIAL COUNTY—Brawley to Westmoreland, 6.5 miles, paving, \$307,700; Westmoreland westerly, 4 miles, paving, \$186,400; Arroyo Salado to north boundary, 13.3 miles, grading and paving, \$539,000; Trifolium Canal to Kane Springs, 6.3 miles, grading and paving, \$172,000.

RIVERSIDE COUNTY—Beaumont to north boundary, 7.2 miles, grading and drainage, \$42,500.

REDDING TO NEVADA LINE VIA ALTURAS

General Facts

Distance—189 miles.

Travel (Summer)—Redding, 500 vehicles; Montgomery Creek, 260; Canby, 213; East of Alturas, 134; Cedarville, 63.

*Condition of Road at the End of the Present Biennium
(June 30, 1929)*

Oil Seal Surface—61 miles.

Rock Surface—36 miles.

Earth Road—92 miles.

Improvements Included in the Budget for the Construction Program of 1929-1931 Biennium

Bridges—9 bridges deemed too narrow and structurally unsafe will be replaced.

Grading and Surfacing—18.2 miles.

Oil Treatment—12.5 miles.

SHASTA-LASSEN COUNTIES—Fall River to Big Valley, 18.2 miles, grading and surfacing, \$285,900.

SHASTA COUNTY—Dry and Salt Creeks, bridges, \$18,000; Canyon Creek, 0.8 mile, bridge and grading, \$11,500; Montgomery Creek, bridge, \$7,000; Burney to Fall River, bridges, \$15,000.

LASSEN-MODOC COUNTIES—Bieber to Adin, 12.5 miles, surfacing, \$20,000.

MODOC COUNTY—Pit River and Shields Creek, bridges and grading, \$54,500.

EL CENTRO TO ARIZONA LINE AT YUMA

General Facts

Distance—57 miles.

Travel—El Centro, 1700 vehicles; Holtville, 1100; Yuma, 1900.

Present Conditions—Paved, 27 miles; oil mix surface, 30 miles.

*Improvements Included in the Budget for Construction
Program of 1929-1931 Biennium*

Pavement—14 miles.

Drainage Improvement—Drainage conditions will be corrected over 5-mile section.

LIST OF PROJECTS IN 1929-1931 BUDGET

IMPERIAL COUNTY—El Centro to Holtville, 9.0 miles, paving, \$482,400; state line at Yuma westerly, 5 miles, grading and paving, \$234,000.

RED BLUFF TO NEVADA LINE NEAR PURDY'S

(Susanville Lateral)

General Facts

Distance—182 miles.

Travel (Summer)—Red Bluff, 600 vehicles per day; Westwood, 1000; Susanville, 1200; Melford, 200.

*Condition of the Road at the Close of the Present
Biennium (June 30, 1929)*

The route will be improved by grading and oiled surfacing except for about 51 miles.

*Improvements Included in Budget for Construction
Program for 1929-1931 Biennium*

Bridges—7 bridges originally built by the county to be replaced by new structures.

Grading and Oil Surfacing—3 miles.

Rock and Oil Surfacing—9.4 miles.

Treated With Oil—23.5 miles.

LIST OF PROJECTS IN 1929-1931 BUDGET

TEHAMA COUNTY—Red Bluff to Paynes Creek, bridges, \$38,000; Mineral to Morgan Springs, 9.4 miles, surfacing, \$42,500.

PLUMAS COUNTY—Feather River at Chester, bridge, \$13,000; south of Chester, 3 miles, grading and surfacing, \$39,300.

PLUMAS-LASSEN COUNTIES—Westwood to Devil's Corral, 13.5 miles, surfacing, \$21,600.

LASSEN COUNTY—Doyle to Long Valley, 10 miles, surfacing, \$16,000.

SAN BERNARDINO TO NEVADA LINE NEAR JEAN

(The Arrowhead Trail)

General Facts

Distance—188 miles.

Travel (Summer)—North of San Bernardino, 2200 vehicles a day; Victorville, 1,400; Barstow, 800; Baker, 200.

Present Condition—Paved 40 miles; oil surface, 58 miles; unimproved, 90 miles.

Improvements Included in Budget for Construction Program for 1929-1931 Biennium

Grading and Oil Rock Surfacing—22.3 miles.

Alignment Improvement—3.5 miles.

Bridges—2 bridges to be rebuilt.

LIST OF PROJECTS IN 1929-1931 BUDGET

SAN BERNARDINO COUNTY—Cajon Pass westerly, 3.5 miles, grading and surfacing, \$175,000; near Cajon Station, bridge and grading, \$18,000; Barstow to Yermo and easterly of Dunn, 22.3 miles, grading and surfacing, \$435,000; Mojave River near Victorville, bridge and grading, \$140,000.

VALLEY ROUTE NEAR BAKERSFIELD TO PASO ROBLES

(Cholame Lateral)

General Facts

Distance—92 miles.

Travel (Summer)—East of Paso Robles, 900 vehicles daily; Kern County line, 400; Lost Hills, 400; Famosa, 300.

Condition of Road at the Close of the Present Biennium (June 30, 1929)

Pavement—76 miles.

Oiled Surface—16 miles.

Improvements Included in Budget for Construction Program for 1929-1931 Biennium

Pavement—21.3 miles.

Grade Crossing—One grade crossing to be eliminated by substitution of subway.

LIST OF PROJECTS IN 1929-1931 BUDGET

SAN LUIS OBISPO COUNTY—Estrella River to Sacramento Ranch, 5.8 miles, paving, \$65,000.

KERN COUNTY—West boundary to Junction Pumping Station, 15.5 miles, grading and paving, \$325,000; at Wasco, grading separation, \$20,000.

ROUTE 4 NEAR ARNO TO ROUTE 23 AT PICKETTS JUNCTION

General Facts

Distance—107 miles.

Travel (Summer)—Twin Cities, 375; west of Ione, 300; west of Jackson, 1200; Pine Grove, 500; Picketts Junction, 128.

Present Condition—This lateral from Twin City on the Sacramento-Stockton road to East of Jackson has been graded, surfaced and oiled and is satisfactorily serving the traffic.

PEANUT TO KUNTZ

Distance—31 miles.

Travel (Summer)—Peanut, 91.

Comment—This secondary road in Trinity County

is without connection at either end with the state highway system. This situation is due to the fact that it antedates the present state highway system, having been made a state highway by the legislature of (1907). It carries a maximum traffic of about 50 vehicles a day, and is maintained by the state to a standard satisfactorily serving the traffic.

AUBURN TO NEVADA LINE NEAR VERDI

(Donner Pass Route)

General Facts

Distance—93 miles.

Travel (Summer, 16-hour count)—East of Auburn, 2400; East of Colfax, 1700; Emigrant Gap, 760; Donner Lake, 900; West of Truckee, 1900.

Condition of Road at Close of Present Biennium (June 30, 1929)

Paved—16 miles.

Oil Mix Surface—45 miles.

Grading and Surfacing—11 miles now under way.

Earth Road—22.5 miles.

Improvements Included in Construction Program for 1929-1931 Biennium

Pavement—10.6 miles.

Grade Crossings—3 grade crossings are to be eliminated (cooperative project with railroad).

Change of Route—New road 10 miles in length to be graded and surfaced to eliminate stretch of narrow, unimproved road.

Bridges—1 new bridge to be built.

LIST OF PROJECTS IN 1929-1931 BUDGET

PLACER-NEVADA COUNTIES—Indian Springs to Soda Springs, 10.7 miles, paving, \$160,000; Airport to Indian Springs, 10 miles, grading and surfacing, \$579,800; at Emigrant Gap and Yuba Gap, grade separation, \$85,000.

NEVADA COUNTY—Yuba River, bridge, \$15,000.

PLACER COUNTY—At New England Mills, grade separation, \$40,000.

MYERS TO NEVADA LINE VIA TRUCKEE RIVER

(Lake Tahoe and Truckee River Highway)

General Facts

Distance—65 miles.

Travel (Summer, 16-hour count)—Tahoe City, 2400; south of Truckee, 1100; east of Truckee, 1400; at Nevada-California state line, 1800.

Condition of Road at Close of Present Biennium (June 30, 1929)

Grading—Entire road now graded to high standard except about 10 miles.

Surfacing—By end of present biennium road will be surfaced for distance of 55 miles, and oiled except for 22.3 miles.

Improvements Included in Budget for Construction Program for 1929-1931 Biennium

Oiling—22.3 miles.

Grading—1.5 miles.

Bridges—1 new bridge to be built.

LIST OF PROJECTS IN 1929-1931 BUDGET

EL DORADO COUNTY—At Emerald Bay, 1.5 miles, grading, \$150,000; Tallac Creek, bridge, \$8,000;

Emerald Bay to Meeks Bay, 7.5 miles, surfacing, \$12,000.

PLACER COUNTY—Tahoe City to Truckee, 14.8 miles, surfacing, \$22,200.

TAHOE CITY TO NEVADA LINE AT CRYSTAL BAY

General Facts

Distance—12 miles.

Travel (Summer)—Tahoe City, 3400; Brockway, 400.

Present Condition—This road, along the northerly end of Lake Tahoe, has been graded, surfaced and oiled.

FROM ROUTE 13 NEAR MONTEZUMA TO ROUTE 23 NEAR MONO LAKE

(Oak Flat Road)

General Facts

Distance—68 miles.

Travel (Summer)—Junction with Sonora Road, 400; east of Groveland, 273; Checking Station at Yosemite, 146.

Present Condition—This is the Big Oak Flat road entrance to the Yosemite National Park and the connection from the easterly side of the park down the Leving grade to a connection with Route 23 east of the Sierra. Improvements of the Priest grade by widening and regrading during the present biennium with other minor corrections have done much to increase the safety for traffic on this road. Relocations of a major nature in order to eliminate excessive grades are in prospect, but definite plans for these changes have not yet been developed.

GENERAL GRANT PARK TO KINGS RIVER CANYON

General Facts

Distance—21 miles.

Travel (Summer)—West of Hume, 83; east of Hume, 27

Present Condition—During the present biennium an exhaustive study of the various routings was made and a definite routing adopted by the Commission. The location survey plans are now under way and, on their completion, in all probability a convict camp will commence construction.

FROM CALIFA TO GILROY

(Pacheco Pass)

General Facts

Distance—84 miles.

Travel (Summer, 16-hour count)—Junction of the road with Hollister, 2000 vehicles; Pacheco Pass, 1800; Los Banos, 1700; Califa, 900.

Present Condition—Paved, 54 miles; oil seal surface, 30 miles.

Improvements Included in Budget for Construction Program for 1929-1931 Biennium

Pavement—16 miles of oil seal surface to be replaced with a higher type of surface.

LIST OF PROJECTS IN 1929-1931 BUDGET

SANTA CLARA COUNTY—San Felipe to east boundary, 16 miles, paving and draining, \$240,000.

SARATOGA GAP NEAR REDWOOD PARK TO BLOOM'S MILL

(In Santa Cruz County)

General Facts

Distance—20 miles.

Travel—Saratoga Gap at Redwood Park Gate, 64 vehicles.

The route is unimproved at present.

Improvements Included in Budget for Construction Program of 1929-1931 Biennium

Grade and Surface—7 miles.

The improvement of the Skyline Boulevard to Saratoga Gap and of the county road from Boulder Creek makes it necessary to improve this road to provide an entrance to Redwood Park for traffic thus developed.

LIST OF PROJECTS IN 1929-1931 BUDGET

SANTA CRUZ COUNTY—Saratoga Gap to Waterman Switchback, 7 miles, grading and surfacing, \$147,000.

SAN BERNARDINO (END OF COUNTY PAVEMENT) TO BEAR LAKE

(Crest Route)

General Facts

Distance 51 miles.

Traffic (Summer, 16-hour count)—Watermans Canyon, 3000 vehicles; Pinecrest, 2200; Big Bear Dam, 1600.

Improvements Included in Budget for Construction Program of 1929-1931 Biennium

Grading and Surfacing—Heavy grading and surfacing will be constructed, portions of 6 miles of exceptionally heavy work being authorized in the biennial budget.

LIST OF PROJECTS IN 1929-1931 BUDGET

SAN BERNARDINO COUNTY—Crest Road, grading and surfacing, \$550,000.

BOULDER CREEK TO REDWOOD PARK

General Facts

Distance—8 miles.

Travel (Summer)—Boulder Creek at Park line, 2100.

Present Condition of Road—This road has been widened and regraded under day labor authorization during the present and past biennium. A considerable portion has been surfaced.

WILLOWS TO ROUTE 3 NORTH OF BIGGS

(Oroville-Willows Lateral)

General Facts

Distance—32 miles.

Travel (Summer, 16-hour count)—Willows east of city 600; Butte City, 400; Cherokee Canal, 63.

LIST OF PROJECTS IN 1929-1931 BUDGET

BUTTE COUNTY—Butte Creek to Cherokee Canal, 7.7 miles, surfacing, \$10,780.

SAN FRANCISCO TO ROUTE 5 NEAR GLENWOOD

(Skyline Boulevard)

General Facts

Distance—64 miles.

Travel (Summer, 16-hour count)—Swimming Pool, 9300; at county road to Colma, 5700; Santa Clara-Santa Cruz County Line, 63.

LIST OF PROJECTS IN 1929-1931 BUDGET

SAN MATEO-SANTA CLARA-SANTA CRUZ COUNTIES—Skyline Boulevard, 13.8 miles, surfacing, \$17,940.

KLAMATH RIVER HIGHWAY*General Facts*

Distance—183 miles.

Traffic (Summer)—Junction Pacific Highway, 400; Thompson Creek, 68; Weitchpec Junction, 48.

Improvements Included in Budget for Construction Program of 1929-1931 Biennium

Bridges—31 bridges, pronounced unsafe, to be replaced.

LIST OF PROJECTS IN 1929-1931 BUDGET

SISKIYOU COUNTY—Thompson Creek, bridge and grading, \$11,000; Oak Flat Creek, bridge, \$8,000; Seiad Valley to west boundary, bridges, \$25,250.

HUMBOLDT COUNTY—Trinity River to east boundary, bridges, \$18,500.

ORLAND TO CHICO*General Facts*

Distance—19 miles.

Travel (Summer)—Orland Junction, 700; Hamilton City, 800; West Chico, 1300.

Present Condition of Road—The construction of the Hamilton City Bridge and approaches and the surfacing and oiling out of Orland enables this route to serve traffic in a satisfactory manner.

MCDONALDS TO THE SEA*General Facts*

Distance—50 miles.

Travel (Summer)—Junction with Redwood Highway, 275 vehicles per day; Booneville, 500; Navarro, 400.

Improvements of Present Biennium

Number of old bridges reconditioned; 8 miles of road improved; 12 miles of oil surface placed.

Improvements Included in Budget for Construction Program of 1929-1931 Biennium

Grading with Portions Surfaced—9 miles.

Bridges—A number of timber bridges considered unsafe will be replaced.

LIST OF PROJECTS IN 1929-1931 BUDGET**ROUTE 1 NEAR McDONALD TO MOUTH OF NAVARRO RIVER**

MENDOCINO COUNTY—Booneville to Flynn Creek (portions), grading and surfacing, \$62,000. Same section, bridges, \$50,000.

CALISTOGA TO ROUTE 15 NEAR CLEAR LAKE*General Facts*

Distance—38 miles.

Travel (Summer)—North of Calistoga, 1300; Middletown, 1200; Lower Lake, 600.

Present Condition of Road—Minor improvements of this route from Mt. St. Helena northerly toward Middletown, together with efficient maintenance of the remaining section, enables this road to serve traffic in a satisfactory manner.

RUMSEY TO ROUTE 15 NEAR WILBUR SPRINGS*General Facts*

Distance—15 miles.

Travel—No road; probable location will be away from existing road.

Present Condition of Road—Further studies to determine location of this route are under way. Upon their completion and the conclusion of a location survey, it is probable that construction by convicts will be undertaken.

SANTA ROSA TO SCHELLVILLE*General Facts*

Distance—22 miles.

Travel (Summer)—East Santa Rosa, 4200; at Sonoma Creek Bridge, 2800; Schellville Junction, 2500.

Present Condition of Road—This road has been constructed to satisfactorily serve travel.

TIBURON TO ALTO

Distance—5 miles.

Travel—Belvedere Junction, 2200.

Present Condition—State maintained road. No construction.

FAIRFIELD TO LODI VIA RIO VISTA*General Facts*

Distance—56 miles.

Travel (Summer)—Denverton Overhead Crossing, 670; Rio Vista Bridge, 1560; West of cannery near Isleton, 3000; Thornton, 1500; Lodi, 1258.

Present Condition of Road—This secondary road is being maintained to satisfactorily serve traffic.

NEAR MICHIGAN BAR TO CENTRAL HOUSE*General Facts*

Distance—9 miles.

Travel (Summer)—Central House, 284.

Present Condition of Road—This road has been graded and oil rock surfaced.

CARMEL TO CAMBRIA*General Facts*

Distance—108 miles.

Travel (Summer)—South of Carmel, 1575; San Simeon, one mile south, 240.

Present Condition of Road—Two convict camps are now prosecuting construction on this road. This work will most probably be continued in the next biennium.

SANTA MARIA TO FREEMAN

(Cuyama and Kern River Route)

General Facts

Distance—193 miles.

Travel (Summer)—Santa Maria, 200 vehicles a day; Kern County Line, 270; Maricopa, 500; 10 miles east of Bakersfield, 1100; Mojave, 100.

Present Condition—Paved, 5 miles; oil mix or seal, 36 miles, gravel surface, 36 miles; earth, 116 miles.

Improvements Included in Budget for Construction Program of 1929-1931 Biennium

Surfacing and Oiling—46 miles (portions).

Grading and Surfacing—21.9 miles.

Widened and Improved—30 miles (portions).

LIST OF PROJECTS IN 1929-1931 BUDGET**SANTA BARBARA-SAN LUIS OBISPO COUNTIES**—Upper Cuyama Valley to east boundary, 46 miles, surfacing, \$285,000.**KERN COUNTY**—Pentland to Route 4, 21.9 miles, grading and paving, \$232,000; Democrat Springs to Welden, 30 miles, grading, \$40,000.**MOJAVE TO ARIZONA LINE NEAR TOPOCK VIA BARSTOW**

(The National Old Trails)

General Facts

Distance—249 miles.

Travel—Mojave, 100 vehicles daily; Barstow, 300; Daggett, 500; Amboy, 300; Needles, 600.

Present Condition—29 miles improved with oil surface.

Under Way—14 miles grading and surfacing.

Improvements Included in Budget for Construction Program for 1929-1931 Biennium

Grading and Surfacing—41 miles to be graded and surfaced with oiled rock.

LIST OF PROJECTS IN 1929-1931 BUDGET**SAN BERNARDINO COUNTY**—Argos easterly, 41 miles, grading and surfacing, \$725,000.**EL RIO TO SERRA***General Facts*

Distance—81 miles.

Travel (16-hour count)—Santa Monica, 30,000 vehicles; Lomita, 10,000; Seal Beach, 21,000; Newport Beach, 13,300.

Condition of Road at the Close of the Present Biennium (June 30, 1929)

Pavement—73.5 miles.

Oil Mix Surface—7.5 miles.

Improvements Included in Budget for Construction Program of 1929-1931 Biennium

Widening Grade and Pavement—Portions of 45.5 miles.

Paving Portion Previously Graded and Surfaced—2 miles.

Grade Separation—One, involving improvement of 1.2 miles of connecting road.

Protection Work Against Damage from Ocean Storms Through Slope Walls or Rip Rap—34 miles.

LIST OF PROJECTS IN 1929-1931 BUDGET**LOS ANGELES-VENTURA COUNTIES**—Santa Monica to Point Mugu, 34 miles, shore protection, \$185,000.**LOS ANGELES COUNTY**—Latigo Creek to Nicholas Creek, 2 miles, grading and surfacing, \$90,000.**ORANGE COUNTY**—Seal Beach to Newport Beach, 11 miles, paving, \$300,000.**VENTURA-LOS ANGELES-ORANGE COUNTIES**—This route shares with Routes 2 and 9 in an allotment of \$1,086,349.71 for grading, paving, bridges and grade separations.**LOS ANGELES COUNTY**—Santa Monica north-erly, shore protection, \$60,000; Santa Monica to Topanga Canyon, 4.5 miles, grading and paving, \$350,000.**LANCASTER TO BAILEYS***General Facts*

Distance—38 miles.

Travel (Summer)—Lancaster Junction, 636; at Bailey's Ranch, 107.

Present Condition of Road—State maintenance keeps this road in a satisfactory condition.

LA CANADA TO MOUNT WILSON ROAD VIA ARROYO SECO*General Facts*

Distance—25 miles.

Travel (16-hour count)—At Pasadena, 2300 vehicles.

Present Condition—3.8 miles graded by the county, balance of route not improved.

Improvements Included in Budget for Construction Program of 1929-1931 Biennium

Grading—Portions of 20-mile section.

LIST OF PROJECTS IN 1929-1931 BUDGET**LOS ANGELES COUNTY**—Arroyo Seco Road, 20 miles, grading, \$500,000.**AZUSA TO PINE FLATS IN SAN GABRIEL CANYON***General Facts*

Distance—28 miles.

Travel—Not under state maintenance.

Present Condition of Road—Proposed construction of the San Gabriel Dam and possible construction of the Pasadena water supply in this canyon will delay the undertaking of any construction projects on this road for several years.

BIG PINE TO OASIS*General Facts*

Distance—41 miles.

Travel (Summer)—Big Pine Junction, 68.

Present Condition of Road—This secondary road is being maintained from state funds.

MECCA TO BLYTHE*General Facts*

Distance—91 miles.

Travel—Desert Center, 80 vehicles daily; Blythe, 150.

Present Condition—About 16 miles has been graded and 32 is now improved with oil surfacing.

Improvements Included in Budget for Construction Program for 1929-1931 Biennium

Grading and Surfacing—20-mile section will be graded and surfaced with oiled rock.

LIST OF PROJECTS IN 1929-1931 BUDGET

RIVERSIDE COUNTY—West of Hopkins Well, 20 miles, grading and surfacing, \$300,000.

VENTURA-LOS ANGELES-ORANGE AND SAN DIEGO COUNTIES—This road participates with State Highway Routes 2 and 9 in certain cooperative projects—Grading, paving, bridges, and grade separations, \$1,086,349.71.

AUBURN TO SONORA

(The Mother Lode Highway)

General Facts

Distance—93 miles.

Travel (Summer, 16-hour count)—At wire bridge near Auburn, 264; north of Placerville, 200; north from Central House near Plymouth, 500; Martell, 850; near Sonora, 300.

Present Condition—Short sections of the route have been improved and surfacing placed. There are 19 miles of oil seal surface; 9 miles of gravel and 65 miles still to be improved both for grading and surfacing.

Improvements Included in Budget for Construction Program of 1929-1931 Biennium

Bridges—3 bridges pronounced structurally unsafe to be replaced with improvement in alignment and approaches.

Grading and Surfacing—9.6 miles to be graded and surfaced with alignment and grade improvement.

LIST OF PROJECTS IN 1929-1931 BUDGET

EL DORADO COUNTY—American River near Lotus, 1 mile, grading, surfacing, bridge, \$70,000.

AMADOR COUNTY—Amador City to Martell, 4.2 miles, grading and surfacing, \$260,000. Cosumnes River, bridge and grading, \$37,000.

CALAVERAS COUNTY—Near Calveritas City, 2.8 miles, grading and surfacing, \$90,000; Calveritas Creek, bridge, \$25,000.

AMADOR-CALAVERAS-TUOLUMNE COUNTIES—Surfacing Mother Lode Highway, \$52,000.

MANTECA TO ROUTE 5, NEAR MOSSDALE SCHOOL

General Facts

Distance—4 miles.

Travel (Summer)—Mossdale Junction, 5350.

Present Condition of Road—The construction in the present biennium, now practically completed, puts this road in a satisfactorily serviceable condition.

PAJARO RIVER TO ROUTE 2 NEAR SAN BENITO BRIDGE

General Facts

Distance—3 miles.

Travel (Summer)—San Juan Bautista, 3390.

Present Condition of Road—This route has been graded and surfaced with bituminous macadam pavement.

SAN FRANCISCO TO SAN JOSE

(The Bayshore Highway)

General Facts

Distance—41 miles.

Travel (Summer, 16-hour count)—San Bruno Junction, 3700; north city limits of South San Francisco, 10,000; South San Francisco Underpass, 10,000.

Condition of Road at the Close of the Present Biennium (June 30, 1929)

By that date 13 miles of the route will be open to travel.

Improvements Included in Budget for Construction Program of 1929-1931 Biennium

Grading and Surfacing—13.9 miles.

Bridges—2 bridges, each 100 feet in width, to be constructed.

Grade Separation—One railroad grade separation (cooperative project with railroad).

Oil Treatment Section Now Graded and Surfaced—3 miles.

**LIST OF PROJECTS IN 1929-1931 BUDGET
SAN FRANCISCO TO SAN JOSE**

(Bayshore Highway)

SAN MATEO COUNTY—San Mateo to Redwood City, 7.4 miles, grading and paving, \$815,000; Redwood Slough, bridge, \$85,000; grade separation near Dumbarton, \$120,000; in San Mateo, 3 miles, surfacing, \$6,000.

SAN MATEO AND SANTA CLARA COUNTIES—Redwood City to Embarcadero Road, 6.5 miles, grading and paving, \$498,868.64. San Francisquito Creek, bridge, \$55,000.

SAN RAFAEL TO SAN QUENTIN

General Facts

Distance—3 miles.

Travel (Summer)—San Quentin Hill, 4450.

Present Condition of Road—A project for the improvement of this route is now being advertised.

UKIAH TO MENDOCINO STATE HOSPITAL

General Facts

Distance—2 miles.

Travel (Summer)—At Ukiah Junction, 873.

Present Condition of Road—This is a short lateral serving the state hospital and is being satisfactorily maintained.

OREGON LINE NEAR CHETCO TO CRESCENT CITY

General Facts

Distance—16 miles.

Travel (Summer)—North of Crescent City, 900; Oregon line, 319.

Present Condition of Road—The construction of a small project near the Oregon line to connect with the Oregon coast road and the rock surfacing from there south to Crescent City makes this road satisfactory for traffic.

DOWNIEVILLE TO MT. PLEASANT

General Facts

Distance—6 miles.

Traffic—9 cars.

Present Condition of Road—This road was made a state highway by legislative act in 1907. Travel upon it is purely local. The road is unimproved.

THE BRIDGE

By VIVIAN CARTER in the *Rotarian*

The Lord, He said to me, "Sambo!
You gotta go, you gotta go.
You'se gonna live no more; instead
I'se gonna make you something dead.
Sambo, what would you like to be
When you have given your life to me?"

I said unto the Lord, I said,
"If you'se gonna make me something dead,
Rather than anything else, I'd choose
To be a bridge, and have my nose
On one bank of a river wide,
My toes upon the other side.

Across my back they'd come and go—
Friend and enemy, fast and slow,
Man and beast, wagon and car,
Jogging along from near and far,
While underneath, unheeding me,
The waters flow on to the sea.

If I were a bridge, mos' blessed Lord,
I'd give you service, 'pon my word;
Helping my fellow man in style,
Philosophising all the while,
Feeling more powerful than a king,
Yet never *doing* a doggone thing."

"I don't see why you call your place a bungalow,"
said Smith to his neighbor.

"Well; if it isn't a bungalow, what is it?" said the
neighbor. "The job was a bungle, and I still owe
for it!"

Mrs. Smythe—"I'm soliciting for the charity organi-
zation. What do you do with your cast off clothing?"

Mr. Smith—"I hang them up carefully and go to
bed. Then in the morning I put them on again."
—*Pointer*.

"What's the fuss in the school-yard sonny?" asked
a gentleman passing a ward school.

"Why, the doctor's just been around examinin' us,
an' one of the deficient boys in knocking hell out of a
perfect kid."

They were discussing silk stockings.

"They were invented in Queen Elizabeth's time,"
said the man who knows everything.

"Yes," commented another, "but they weren't dis-
covered till the twentieth century."—*Tit-Bits*.

In Detroit, recently, two autoists met in an alley
too narrow to permit them to pass each other. One
of the autoists rose in his car and shouted at the
other:

"I never back up for any d—n fool."

The other driver quietly put his car in reverse,
backed out, and replied:

"That's all right. I always do."

IN OTHER STATES

NEW MEXICO has joined the growing ranks of
the states which use the oil-mix type of gravel road.
An 11-mile section was built in Valencia County in
June, and if this proves satisfactory other sections
are to be built.

MINNESOTA—Maintenance work on state high-
ways is being gradually motorized. Motor equipment
is now used exclusively on 3600 miles, while teams
used on 3400 miles are in many places supplemented
with power graders.

SOUTH DAKOTA—The South Dakota County
Commissioners Association is urging the adoption of
standard county road markers throughout the state.
Signs conforming to the proposed standards have been
installed by a leading county.

TEXAS—Contracts were awarded by the state
highway department for 1553 miles of new construc-
tion during 1927 and the first half of 1928. The total
estimated cost is \$21,340,000. In addition 1056 miles
of maintenance contracts were let.

OHIO—A new law provides that all traffic lights
erected along state highways by cities and villages
must receive the O. K. of the state highway depart-
ment before being operated. This law covers lights
now in service as well as future installations.

NORTH CAROLINA—Buncombe County recently
completed a parallel highway to relieve congestion on
state route No. 69 entering Asheville. The new high-
way, 8½ miles long, is at no point more than one
mile from the old route.

IOWA—Contracts for 186 miles of pavement were
let during July, August and September. With the
additional lettings made during the fall months more
than 200 miles of hard surfacing was initiated or com-
pleted on the state highways during 1927.

Twenty-five years ago the family horse was fed in
the stable and paid for before it was driven. Today
the family car is nourished with gasoline at a public
filling station and may or may not be paid for before
it is used, writes William Boyd Craig, in the Nation's
Business. A quarter of a century ago gasoline was
known in the home principally as a fluid which would
remove spots from clothing and was dangerous near
flames. Last year more than 12,000,000,000 gallons
were produced to satisfy an ever-growing demand.

By the latest registration figures there is a motor
car for every sixth American and a gas station for
every 80 automobiles in the country. In some states
there is probably a filling station for every 50 cars.
Of the 29,000,000 cars and trucks now running the
average uses just under 500 gallons a year, and
between 20 and 25 gallons of oil.

"We are more heavily taxed by our idleness, pride
and folly than we are taxed by government."

We found this gem among Benjamin Franklin's
sayings when we were glancing through his writings
on his birthday last week. What he wrote a century
and a half ago is just as true today.

If we may be permitted to paraphrase "Poor
Richard," we could well say today:

"We are more heavily taxed by poor roads, which
consume our gasoline, wear our tires and ruin our
cars, than we are taxed for good roads."—Exchange.

Progress Reports From the Counties

ALAMEDA COUNTY

Bids were received in District IV office for the construction of 16,800 feet of laminated guard rail to be placed on the Dublin Canyon road between Dublin and Hayward. This section of road as recently reconstructed by Ariss-Knapp Company is an extremely high speed highway with wide swinging curves and rolling grades. As the fills are high and the oil macadam pavement does not allow of paint strips, the traffic tends to swing off center rendering the fills unsafe and the construction of the guard rail will be a valuable safeguard. The contract has been awarded to the low bidder, Lee J. Immel of Oakland, and work is rapidly progressing.

ALPINE COUNTY

All roads in Alpine County with exception of Markleeville to Woodfords are closed for winter; the latter stretch has been rocked to allow all-year travel between Woodfords and Markleeville.

AMADOR COUNTY

Maintenance forces have just completed surfacing all muddy spots on Mother Lode Highway between Plymouth and Cosumnes River, placing this stretch in excellent condition for winter travel.

Maintenance forces have started widening and straightening the Alpine Highway between Chapmans and Dew Drop Inn.

BUTTE COUNTY

The construction of the highway between Butte Creek and Biggs road has recently been completed. A graded roadbed 30 feet wide has been surfaced with pit run gravel 20 feet wide by 6 inches thick. L. C. and W. E. Karstedt were the contractors on this work.

CALAVERAS COUNTY

The Big Trees Highway from Angels Camp to Big Trees was freed from snow and placed in excellent condition for the annual snow frolic at Big Trees on January 13. A large crowd attended as usual.

COLUSA COUNTY

Portions of the present highway from the westerly county line to Mountain House (Venado), which were greatly in need of resurfacing, have been surfaced with gravel by Hemstreet and Bell, the contractors. The work was completed in December, 1928.

CONTRA COSTA COUNTY

Contract for the reconstruction of a section of the Oakland-Martinez road, from the boundary of the town of Richmond 1.3 miles northerly to San Pablo, has been awarded to the Warren Construction Company of Oakland. The work to be done consists of widening the existing roadbed to 56 foot and 46 foot widths and widening the existing pavement to 40 foot and 30 foot widths, surfacing same with asphalt

concrete. The amount of 9600 tons of type "A" asphalt concrete is not large but the low price of \$4.25 per ton for same marks a record price for asphalt concrete in this District as this material has always been relatively high priced. The contractor has accomplished much in the short time since he started work on November 15th and ought to be finished in several weeks.

EL DORADO COUNTY

Plans have been made for 5½ miles of construction of a 24-foot graded roadbed between Riverton and Kyburz on the Placerville route to Lake Tahoe.

It is proposed to follow the grading shortly after completion with surfacing on the first 3¼ miles of the project. This section of the highway is in the El Dorado National Forest, and will be financed jointly by the state and federal government. This work will be a continuation easterly of the improvement already made from the west limits of the national forest (near the Pacific Ranger Station) to the beginning of this proposed project.

The improvement of this unit will eliminate a number of sharp dangerous curves, and will greatly increase the enjoyment of travelers to Lake Tahoe and Nevada.

FRESNO COUNTY

Erection of steel on the Herndon Bridge has been completed by Carl H. Peterson, contractor.

Funds have been allotted for continuing the placing of gravel in Warthan Creek Canyon on the Sierra-to-the-Sea Highway west of Coalinga.

GLENN COUNTY

The 5 miles of grading roadway between Logandale and Willows, and which D. McDonald is under contract to build, has progressed slower than expected. It will probably be some time in April before the work will be completed.

A contract was let in December, 1928, to E. B. Skeels for the building of a three-span reinforced concrete bridge across Quint Canal, about four miles east of Willows. Traffic is being detoured across the canal by means of a temporary timber bridge close to the site of the new structure.

KERN COUNTY

The Valley Paving Company, which has the contract for surfacing 10 miles of Route 33 from Famosa to Wasco, with asphaltic concrete, are making good headway with the grading work and will start laying surface about February first.

Force, Currgan & McLeod have started work on their contract for grading and oil-mixed surfacing on the Kern River Highway from Bakersfield to the mouth of the Kern Canyon.

The contract for grading and surfacing from Pentland to Conners Station Road on Route 57, has been awarded to C. W. Hartman of Bakersfield.

The survey from Bakersfield to Mojave, over the Tehachapi Pass is in charge of S. A. Cobb and good progress is being made.

KINGS COUNTY

Maintenance crews are widening roadway and enlarging the drainage system near Armona.

LAKE COUNTY

The rocking and oiling of the section of state highway from Kelseyville Junction to Lakeport, 1.1 miles, by state forces has met with hearty appreciation of the local inhabitants. This job, the building up of the existing road metal to a depth of 7 inches and width of 20 feet with two applications of 95% Bitumuls in two applications of 1 1/3 gallon each with screenings, shows up as a fine specimen of this type of road, and there is much local talk of how to have more road so improved.

The grading of a 24-foot highway between Lucerne and Abbott Mine, which is being built by the convict labor forces, is progressing satisfactorily, and will be completed about March.

A contract was let in December, 1928, for 10.6 miles of grading and surfacing with oil treated crushed stone between Lucerne and Clear Lake Oaks.

Von der Heller, Pierson and Logan, the contractors, expect to have the work finished by October.

LOS ANGELES COUNTY

Work is in progress on the reconstruction of about seven-tenths mile of highway between the northerly boundary of the city of Los Angeles and Newhall Tunnel, where the alignment will be improved and the roadway widened to forty feet, and paved with bituminous macadam.

The construction of eight and five-tenths miles of new state highway between Tunnel Station and the Santa Clara River, through Weldon and Gavin canyons, is well under way with much heavy equipment on the job to carry on the work.

Grading and culverts have been completed and the asphaltic concrete pavement 30 feet wide is now being placed on a 1.4 mile stretch of Foothill Boulevard between Glendora and La Verne.

Through the Malibu Ranch and extending into Ventura County along an eleven and a half mile stretch of highway, the construction of a twenty foot Portland cement concrete and bituminous macadam pavement is in progress. Over two miles of half width concrete pavement, 10 feet wide, is now in place.

MADERA COUNTY

A. W. Kitchen has completed the substructures at Ash and Berenda sloughs on the Pacheco Pass Highway and is pouring the concrete surface.

Hanrahan Company have completed about a mile of pavement on their asphaltic concrete job north of Madera on the Golden State Highway. Work has also been started on the approaches to the San Joaquin River Bridge at Herndon.

MARIN COUNTY

Hanrahan Company have almost finished the 4 1/2 miles of second story pavement from Ignacio to Gallinas Creek, just north of San Rafael. It is a beautiful specimen of concrete pavement and the inconveniences suffered during the rather protracted construction period are soon forgotten in smoothly riding over the new work.

M. C. Fosgate, resident engineer on this job, having completed a good job on this contract, is now busy superintending the construction of the San Rafael-San Quentin road.

Granfield, Farrar and Carlin of San Francisco are contractors on this job and have made a flying start, driving piles to carry concrete structures in the low marshy lands and opening up cuts preparatory to making fills across the marshes. This improvement is a connection between the Redwood Highway at San Rafael and the Richmond-San Quentin Ferry at San Quentin.

The first half mile out of San Rafael is a portion of the proposed new road to Sausalito and the remainder follows, in general, the old toll road with improved alignment and grades.

The new work consists of grading a 56-foot roadbed and building a 40-foot by 4-inches bituminous macadam pavement on the first half mile and grading

a 36-foot roadbed and a 20-foot bituminous macadam roadway on the remaining section.

Simultaneous with this contract, Granfield, Farrar and Carlin are low bidders for a contract for a connection near Alto of the Redwood Highway with the section of the Alto to Tiburon road that was constructed in 1914. This is a small job, about 0.6 mile of bituminous macadam pavement similar to the San Rafael-San Quentin job. It is expected that the contract will be awarded and work started very soon and that the contract will be completed in the 100-day period allowed by contract.

MARIPOSA COUNTY

Basich Brothers, contractors, are making good progress on their contract for grading and surfacing on the Yosemite All-Year Highway. Culverts and bridges are nearing completion and surfacing will be started by February 15.

The day labor crew, under Superintendent Carl Nelson, is widening and straightening line on the famous Briceburg Grade at the entrance to Merced Canyon.

Fourteen inches of snow fell at the Bear Creek Summit on the Mariposa road on the night of January 20 and by working all Saturday night, the maintenance forces had the road completely cleared by Sunday noon.

MERCED COUNTY

Considerable widening is being done by maintenance forces on the narrow grade west of Los Banos on the Pacheco Pass Highway.

Repairs to the drawbridge over the San Joaquin River near Los Banos have been completed.

MONTEREY COUNTY

Plans have been completed for an extensive line change, south of the Salinas River Bridge at San Ardo. Realignment 0.6 of a mile in length will eliminate a blind 300 foot radius curve on practically a right angle turn and on a 6 per cent grade.

On the Coast Highway, between San Ardo and San Lucas a line change 0.4 mile in length is now under construction with the work consisting of a graded roadbed 30 feet in width with 20 feet by 6 inch waterbound macadam surfacing. The work is being carried on under contract with W. A. Dontanville. Another accident-causing curve will be done away with.

Between Greenfield and King City two line changes approximately 0.2 and 0.5 miles in length are now under construction. The work consisting of a graded roadbed 30 feet in width with 20 feet by 6 inches waterbound macadam surfacing. Work is being done under contract with Granite Construction Company. Three bad curves where numerous accidents have occurred are eliminated by this contract.

Surveys are now in progress for the proposed reconstruction of the Coast Highway between Salinas and Chualar.

Between Salinas and Chualar plans have been prepared for an overhead crossing over the Southern Pacific Railroad, at a point locally known as Spence crossing. The plans prepared involve realignment for a distance of 0.6 miles with an overhead bridge approximately 1000 feet in length.

On the Carmel-San Simeon Highway construction work is in progress both north and south of the Little Sur River and between Salmon Creek and Villa Creek. The work being carried on by the use of State convict labor. A crew of approximately 80 men and two power shovels are working in the vicinity of the Little Sur River and 180 men and two power shovels are building north from Salmon Creek.

In the vicinity of the Carmel Highlands surveys have been completed. Preliminary investigations and studies are now being made to determine possible relocations of the highway in this vicinity.

NEVADA COUNTY

The work under contract by the Callahan Construction Company, between Indian Springs and Soda Springs, consisting of a 24-foot graded roadbed 10.6 miles in length, was suspended on November 17, 1928.

A heavy snowfall at that time stopped the operation of the work; other snowfalls since have made conditions such that a resumption of work will hardly be made before the middle of March of this year. It is expected, however, that the work will be completed by August, which is the date set for completion.

Between Donner Lake and Truckee, inclement weather conditions have caused a suspension of the grading and surfacing, which have been under way since September. The Mathews Construction Company are under contract to do this work, which was suspended January 12. It is expected that a resumption of work can be made about April 1, and the completion of the work will be about the middle of May.

Plans are complete, and an estimate has been made, for the construction between Nevada City and Washington Road of 12½ miles of a graded roadbed 24 feet wide and surfacing with 6 inches thick, 20 feet wide, crushed rock with the top 3 inches oil mixed.

The road is a unit of the Tahoe-Ukiah highway, and connects Nevada City with a county road leading to the town of Washington on the South Yuba River.

ORANGE COUNTY

The reconstruction of the state highway between Anaheim and Fullerton has been completed and opened to traffic. The new pavement, which is of Portland cement, is 56 feet wide between curbs.

The paving of two-tenths mile of highway with cement concrete on an improved alignment near San Clemente has been completed and opened to traffic.

PLACER COUNTY

A contract has been let to Frederickson and Watson Construction Co. and Frederickson Bros. for grading and paving with bituminous macadam the approaches to the Bowman and Weimar overhead crossings. The total length of the work is 2 miles.

The overhead crossings which are being built under contract, and which separate the tracks of the S. P. R. R. from the highway, are expected to be completed about March.

The paving of the approaches will be completed about the end of May.

E. F. Hilliard, contractor, has completed the work of surfacing with bituminous macadam 2 miles of state highway between Sheridan and the northerly county line.

SACRAMENTO COUNTY

The paving on the contract from Galt to Arno is complete; traffic will soon be routed straight through, eliminating a detour which has been in use several months. Frederickson & Watson Construction Company and Frederickson Bros. are the contractors. C. M. Butts is the resident engineer.

The new asphalt concrete pavement between North Sacramento and Del Paso Park was completed by Clark and Henery Construction Co., contractors, in December, 1928.

Survey plans are being proposed for the improvement of the highway between Ben Ali and Sylvan School.

SAN BENITO COUNTY

Preliminary surveys for an improved road connecting Hollister and Pinnacles National Forest by way of Paicines are nearly complete and plans for construction are now being prepared in the District Office. This work is being carried on to cooperate with the Board of Supervisors of San Benito County.

On the Coast Highway, north of San Juan, a non-skid surface is now being placed. South of San Juan and over the San Juan grade the traffic stripe is being renewed. Work being done by the District Maintenance.

SAN DIEGO COUNTY

On the San Diego to El Centro Highway are three reconstruction jobs in progress.

From Viejas Creek to Guatay Creek, a distance of 7.2 miles, the Hauser Construction Co. is reconstructing the highway along an improved alignment and widening the roadway. They are well equipped and have already completed the rough grading on three miles of heavy work.

Between Guatay Creek and Pine Valley, about 3.9 miles, the Nevada Contracting Company is placing culverts and grading for the improved roadway.

Easterly from Pine Valley and extending 7.2 miles to Kitchen Creek the highway is to be paved with a 20 foot Portland cement concrete pavement. The Basich Brothers Construction Company have the contract for the work. The opening of quarries, grading, culvert placing and other preliminary work is in progress.

SAN JOAQUIN COUNTY

The traffic is now using the new entrance to Stockton on the north. Gannon and McCarty completed this work in fine time. Geo. R. Hubbard was the resident engineer.

A small grading and surfacing job to connect the new pavement with the road north of French Camp is under way. Willard & Biasotti are the contractors. Geo. R. Hubbard is resident engineer.

The grading and oil mix surfacing job on the new location between Mossdale and French Camp is nearing completion. The contractor is Mankel & Staring. C. M. Butts is the resident engineer.

SAN LUIS OBISPO COUNTY

On the Coast Highway between Arroyo Grande and Pismo the construction of 3.3 miles of grading and paving has recently been started by the Cornwall Construction Company.

Extending from Pismo to San Luis Obispo on the Coast Highway, the construction of a project 10.8 miles in length, including grading and paving, was recently completed in a very satisfactory manner by J. F. Knapp, contractor.

This project involved considerable realignment and resulted in a highly improved roadway connecting San Luis Obispo and the beach.

On the above project a reinforced concrete bridge 266 feet in length is now under construction by Chas. and F. W. Steffen as contractors, and is under the supervision of the Bridge Department.

North from the city limits of San Luis Obispo the highway is to realign for one mile and graded to a roadbed width of 36 feet and surfaced with waterbound macadam 20 feet by 6 inches in width with an oil treated surface. Contract for this construction was recently awarded to the Ariss-Knapp Construction Company.

At Santa Margarita, survey and plans have been completed for reconstruction on a line change at the north end of the town. The proposed construction will eliminate a sharp curve on which is located a narrow concrete bridge of early design. The proposed work will include the construction of a new bridge with a change in the existing creek channel.

Surveys and plans are in progress for the reconstruction of the Coast Highway over a distance of 10.2 miles, between Atascadero and Paso Robles. The work contemplated consists of widening the existing roadbed to an overall width of 36 feet, and the paving reconstructed to a width of 20 feet. Changes in alignment will eliminate several dangerous curves.

On the Cholame Lateral, from a point 1.7 miles west of Shandon to the San Luis Obispo-Kern County line, a distance of 15.4 miles, the existing highway is now being reggraded to a roadbed width of 24 feet and surfaced with bituminous macadam 18 feet in width. The construction is being carried on under contract with A. Teichert and Son.

On the Carmel-San Simeon Highway two wooden bridges are now under construction, one 266 feet long across the Arroyo la Cruz Creek and one 171 feet long across the San Carpojo Creek. These bridges are being built by Chas. and F. W. Steffen, under the supervision of the Bridge Department.

The approaches to both the above bridges involving the grading and surfacing of approximately one mile of roadway, on realignment, is being handled under contract with W. J. Taylor.

Construction of the new equipment shops and storage sheds in San Luis Obispo is progressing under contract with W. J. Smith.

SAN MATEO COUNTY

See article entitled "Bayshore Highway Construction Proves Gigantic Project."

SAN MATEO, SANTA CLARA AND SANTA CRUZ COUNTIES

The Skyline Boulevard between the La Honda Road and Saratoga Gap has been rough graded by the contractors, Twohy Bros. Co. and J. F. Shea Co. The work was practically completed before the rains set in and little remains to be done but the surfacing.

An excellent quarry has been opened and while most of the equipment has been released as no longer needed and of little use during the wet weather, the surfacing is progressing as the quarry can be operated and rock surface placed despite rains and storms.

None of the road is open to traffic but it is expected that by about July the rocking will be finished and the road will be ready for use. It is certain that the traveling public will appreciate it as the new work will be a beautiful addition to the present road which is already one of the finest roads in the State as well as a connecting link in the road to the California Redwood Park and Santa Cruz.

SANTA BARBARA COUNTY

On the Coast Highway between Benham and Carpinteria a line change over the Rincon Hill is under construction, which involves the grading of a roadbed 46 feet wide, to be paved with concrete 30 feet in width. This work is being carried on under contract with McCray Company.

Included in the above line change a steel and concrete overhead bridge 570 feet in length is being constructed over the main line tracks of the Southern Pacific Railroad. A reinforced concrete arch culvert 20 feet by 17.5 feet, of special design, is being constructed at the Rincon Creek. The two structures are being built under contract with Paul M. White and are being handled under the supervision of the Bridge Department.

South of Montecito 0.3 miles of construction is under way, involving the grading of a roadbed 46 feet in width to be paved with concrete 30 feet wide. The work is being carried out under contract with the Cornwall Construction Company.

Between Goleta and Naples, for a distance of 3.5 miles, construction is in progress involving the grading of a roadbed 36 feet in width, to be paved with second story asphaltic concrete 20 feet in width. This work is being carried on under contract with San Hunter.

In the Gaviota Canyon between Las Cruces and Gaviota, surveys for an extensive realignment of the existing highway have been completed and plans for construction are now in progress in the district office.

SOLANO COUNTY

The widening of the roadway with earth, and grading line changes from Fairfield north for five miles is progressing. The contractor is Mankel & Staring. R. H. Lapp is the resident engineer.

Oil mix borders will be placed along present pavement and as a surface on the line changes.

The cut-off back of Cordelia has been completed, but is not open to traffic. This is a grading and plant oil mix surfacing job; also a concrete bridge over Green Valley Creek. The contractor was Larsen Brothers of Sonoma, and J. W. Cole was the resident engineer.

A considerable part of the asphalt concrete pavement between Fairfield and Dixon has been planned to free the pavement of excess asphalt and make it more non-skid, and therefore much safer for winter traffic. It is noted that accidents have been greatly reduced over recent years.

SONOMA COUNTY

In this county also the Redwood Highway is receiving attention.

The 11.44 miles of road from Santa Rosa to Willow Brook just north of Petaluma, is being improved by

grading a 36-foot roadway and the placing a 20-foot Portland cement second-story pavement on the existing 15 feet of concrete.

The contract, as awarded to H. H. Peterson, was assigned to E. Paul Ford, and is well under way. Grading, including several line changes and extensions of existing concrete boxes and small bridges have been practically completed. The laying of concrete pavement is well started. The completion of this section will provide a finished high standard concrete and asphalt pavement 18 feet wide from Cloverdale to Healdsburg and 20 feet wide to one mile south of Petaluma.

TULARE COUNTY

C. W. Wood, contractor on the concrete shoulder job from the Plaza Garage to the Oak Grove School, has made a rapid start and should have this work completed well ahead of scheduled time.

Fred W. Nighbert, who received the contract for placing an oil-mixed surface on the portion of the Sierra-to-the-Sea Highway connecting with the General's Highway in Sequoia National Park, has completed his crusher, and mixing plant set-up and is ready to start placing surfacing.

HIGHWAY RESEARCH IN THE UNITED STATES

(Continued from page 9.)

and by the California Division of Highways to determine the relative value of different methods of curing concrete pavements. Mr. Gonnerman is also conducting some interesting tests relative to the permeability of designed concrete mixtures, and also the causes of checking and "crazing" of concrete surfaces, as well as of the lasting quality of various pigments used as an admixture to color concrete surfaces.

At the Chicago Paving Laboratory an opportunity was afforded to have a discussion with Messrs. H. W. Skidmore and Gene Abson. Skidmore and Abson are considered authorities on asphalt pavement design and construction and in connection with their work have published a number of articles and have designed equipment for making special tests of the stability of asphaltic concrete mixtures.

TWO HIGHWAY BUDGETS

(Continued from page 1.)

the highways pay in proportion to their enjoyment of the benefits of these good roads has been amply demonstrated. * * * The experiment has been so successful, the tax so easy of collection, the fairness of it so universally conceded, and the saving so great over the previous method of financing it is most improbable that the people of California will ever revert to the issuance of interest-bearing securities for an enterprise of this character.

"The percentage of overhead cost is being steadily reduced, efficiency of operation is being increased and it can probably be said that both in expense and quality of road con-

struction and in its businesslike administration, California stands at the forefront of all of the states."

MASSACHUSETTS—The state registrar of motor vehicles employs a special squad of trained investigators to determine the underlying causes of fatal traffic accidents reported.

Record of Bids and Awards

IMPERIAL COUNTY—Between El Centro and Brawley, 9.8 miles grading and Portland cement concrete pavement. Dist. VIII, Rt. 26, Sec. F-G. J. F. Knapp, Stockton, \$372,434; V. R. Dennis Const. Co., San Diego, \$429,461.90; Wells & Bressler, Santa Ana, \$375,894; R. E. Hazard Contract Co., San Diego, \$315,411.50; Geo. Herz & Co., San Bernardino, \$329,931.80; Match Bros., Elsinore, \$331,423.10. Contract awarded to R. E. Hazard Contracting Company.

MADERA COUNTY—Approaches to Ash and Berenda Slough bridges, about 0.3 mi. in length to be graded and surfaced with oil treated crushed gravel or stone. Div. VI, Rt. 32, Sec. A. Contract awarded to C. W. Wood of Stockton, \$10,895.

MARIN COUNTY—At Alto, 0.6 mile to be graded and paved with bituminous macadam. Dist. IV, Rt. 52, Sec. A. Allied Contractors, Inc., Omaha, Neb., \$34,316.60; Larsen Bros., Sonoma, \$33,180.10; Tieslau Bros., Berkeley, \$38,004.10; J. F. Collins, Stockton, \$32,419; J. V. Galbraith, Petaluma, \$34,996.20; Frederickson & Watson Const. Co., Oakland, \$28,289.50; Granfield, Farrar & Carlin, San Francisco, \$27,207.10; M. J. Bevanda, Stockton, \$34,867.50; H. V. Tucker, San Francisco, \$27,300.80; J. P. Holland, Inc., San Francisco, \$28,836.30; James Currie, Burlingame, \$38,256; McDonald and Maggiora, Sausalito, \$32,823. Contract awarded to Granfield, Farrar & Carlin, San Francisco.

MARIN COUNTY—Bet. Alto and Sausalito, about 3.6 miles to be surfaced with asphalt concrete. Dist. IV, Rt. 1, Sec. B. Pacific States Const. Co., San Francisco, \$34,186; A. G. Raisch, San Francisco, \$49,238.60; Hollywood Paving Co., Los Angeles and San Rafael, \$33,440. Contract awarded to Hollywood Paving Co.

KERN COUNTY—Bet. Bakersfield and 1.5 mi. E. of Cottonwood Cr., 11 mi. grading and oil treated crushed gravel or stone surfacing. Dist. VI, Rt. 57, Sec. E-F. G. W. Ellis, Glendale, \$203,304.50; Schelling & Schelling, Burbank, \$226,963.80; The Callahan Const. Co., Inc., Los Angeles, \$213,728.75; J. F. Collins, Stockton, \$203,640; Frederickson & Watson Const. Co. & Frederickson Bros., Oakland, \$192,086.30; C. W. Wood, Stockton, \$225,943.50; A. J. & J. L. Fairbanks, Inc., South San Francisco, \$249,490.95; Isbell Const. Co., Fresno, \$200,142; Fred W. Nighbert, Bakersfield, \$182,030.60; John Jurkovich, Fresno, \$209,289; Lewis Const. Co., Los Angeles, \$194,496.50; Force, Currgan & McLeod, Oakland, \$170,685.50; C. W. Hartman, Bakersfield, \$193,365.10; Hanrahan Company, San Francisco, \$209,837.80; A. Teichert & Son, Inc., Sacramento, \$237,031.50; C. R. Adams, Oakland, \$179,574; George Pollock Co., Sacramento, \$238,168. Contract awarded to Force, Currgan & McLeod of Oakland.

KERN COUNTY—Bet. Pentland and San Emigdio Road, 12.2 miles grading and surfacing with crushed gravel or stone. Dist. VI, Rt. 57, Sec. B-D. C. W. Hartman, Bakersfield, \$70,158.40; John Jurkovich, Fresno, \$88,457; Charles W. Wimmer, Taft, \$79,779.50; G. W. Ellis, Glendale, \$94,792.80; Force, Currgan & McLeod, Oakland, \$91,048.50; Tieslau Bros., Berkeley, \$87,577.60; Chas. Harlowe, Oakland, \$79,574.50; A. J. Grier, Oakland, \$95,000; G. E. Finnell, Sacramento, \$89,137; J. F. Collins, Stockton, \$71,726; S. W. Gleim, Los Angeles, \$38,379.50; Frederickson & Watson Const. Co., and Frederickson Bros., Oakland, \$73,569. Contract awarded to C. W. Hartman, Bakersfield, \$70,158.40.

LOS ANGELES COUNTY—Bet. Glendora and Claremont, 5.5 miles grading and asphalt concrete pavement. Dist. VII, Rt. 9, Secs. I, J-C. George R. Curtis Paving Co., Los Angeles, \$339,047.50; Griffith Co., Los Angeles, \$289,100; Geo. H. Oswald, Los Angeles, \$337,296; Gibbons and Reed, Burbank, \$319,926; Osborn Co., Pasadena, \$294,855; Ed. Johnson, Los Angeles, \$325,232.50; Hall-Johnson, Alhambra, \$267,240. Contract awarded to Griffith Co., Los Angeles.

LOS ANGELES AND SAN BERNARDINO COUNTIES—Dist. VIII, Rt. 9, Sec. D-A. George R. Curtis Paving Co., Los Angeles, \$330,592.25; Griffith Co., Los Angeles, \$302,813.40; Geo. H. Oswald, Los Angeles, \$327,613; Gibbons & Reed, Burbank, \$359,172.90; Southwest Paving Co., Los Angeles, \$293,345.90; Steele Finley, Santa Ana, \$275,533; Hall-Johnson Co., Alhambra, \$332,119.75. Contract awarded to Steele Finley, Santa Ana.

MONTEREY COUNTY—Between north end of Nacimiento Bridge and Bradley, about 4.9 miles of rock borders to be constructed on each side of existing Portland cement concrete pavement. Dist. V, Rt. 2, Sec. I. Granite Const. Co., Watsonville, \$8,694; Geo. French, Jr., Stockton, \$4,482; Tiffany, McReynolds & Tiffany, San Jose, \$5,265; E. T. Carter, Santa Barbara, \$7,506; W. A. Dontanville, Salinas, \$7,290. Contract awarded to Geo. French, Jr., Stockton.

PLACER COUNTY—At Bowman and Weimar, 2 miles grading and bituminous macadam pavement. Dist. III, Rt. 37, Secs. A-B. Mathews Const. Co., Sacramento, \$58,479.50; Nate Lovelace, Sacramento, \$55,841; C. W. Wood, Stockton, \$54,833; Young Bros., Berkeley, \$68,331; G. E. Finnell, Sacramento, \$52,382; Frederickson & Watson and Frederickson Bros., Oakland, \$50,080; Isbell Const. Co., Fresno, \$79,996; E. B. Skeels, Roseville, \$79,777; A. Teichert & Son, Sacramento, \$66,868; J. P. Holland, Inc., San Francisco, \$61,750; C. R. Adams, Oakland, \$51,576; S. H. Palmer Co., San Francisco, \$61,098. Contract awarded to Frederickson, Watson and Frederickson Bros.

SAN BERNARDINO COUNTY—Bet. Pomona and 1 1/2 mile east of Ontario, 2.5 miles grading and paving with Portland cement concrete. Dist. VIII, Rt. 19, Sec. A-B. Griffith Company, Los Angeles, \$80,937; Flemming Const. Co., Pomona, \$85,308; George Herz & Co., San Bernardino, \$84,792; Match Bros., Elsinore, \$79,264.70; J. F. Knapp, Stockton, \$82,151; Hall-Johnson Co., Alhambra, \$93,776; Bartlett & Mathews, Pasadena, \$90,225. Contract awarded to Match Bros., Elsinore.

SAN LUIS OBISPO COUNTY—Between San Luis Obispo and City Reservoir, 1 mile grading and surfacing with oil treated crushed gravel or stone. Dist. V, Rt. 2, Sec. D. Cornwall Const. Co., Santa Barbara, \$67,836; C. T. Malcom, Walnut Creek, \$62,167; W. C. Colley and C. C. Gildersleeve, Felton, \$59,044; Ariss Knapp Co., Oakland, \$54,841.90; John C. Gist, Arcadia, \$58,255; W. A. Dontanville, Salinas, \$56,153. Contract awarded to Arris, Knapp Co., Oakland.

SANTA BARBARA COUNTY—Overhead crossing over S. P. R. R. near Benefham, and Rincon Creek culvert. Dist. V, Rt. 2, Sec. H. Anton Johnson Co., Los Angeles, \$104,489; McWilliams & Ritchey, Los Angeles, \$110,355; John Simpson Co., Los Angeles, \$100,569; Otto Parlier, Tulare, \$108,961; Butte Const. Co., San Francisco, \$102,991; Barrett & Hilp, San Francisco, \$108,585; Paul M. White, Santa Monica, \$97,258.50; E. S. Johnson, Pasadena, \$104,918; DeWaard & Son, San Diego, \$103,737; Byerts & Dunn, Los Angeles, \$106,940; Frederickrick & Watson and Frederickson Bros., Oakland, \$104,182. Contract awarded to Paul M. White, Santa Monica.

SANTA BARBARA COUNTY—Between Stoney Creek and Tecolote Creek, 3.4 miles grading and surfacing with asphalt concrete. Dist. V, Rt. 2, Sec. I-G. Cornwall Const. Co., Santa Barbara, \$127,464; Force, Currgan & McLeod, Oakland, \$123,106; Sam Hunter, Santa Barbara, \$111,052; Griffith Co., Los Angeles, \$124,146. Contract awarded to Sam Hunter.

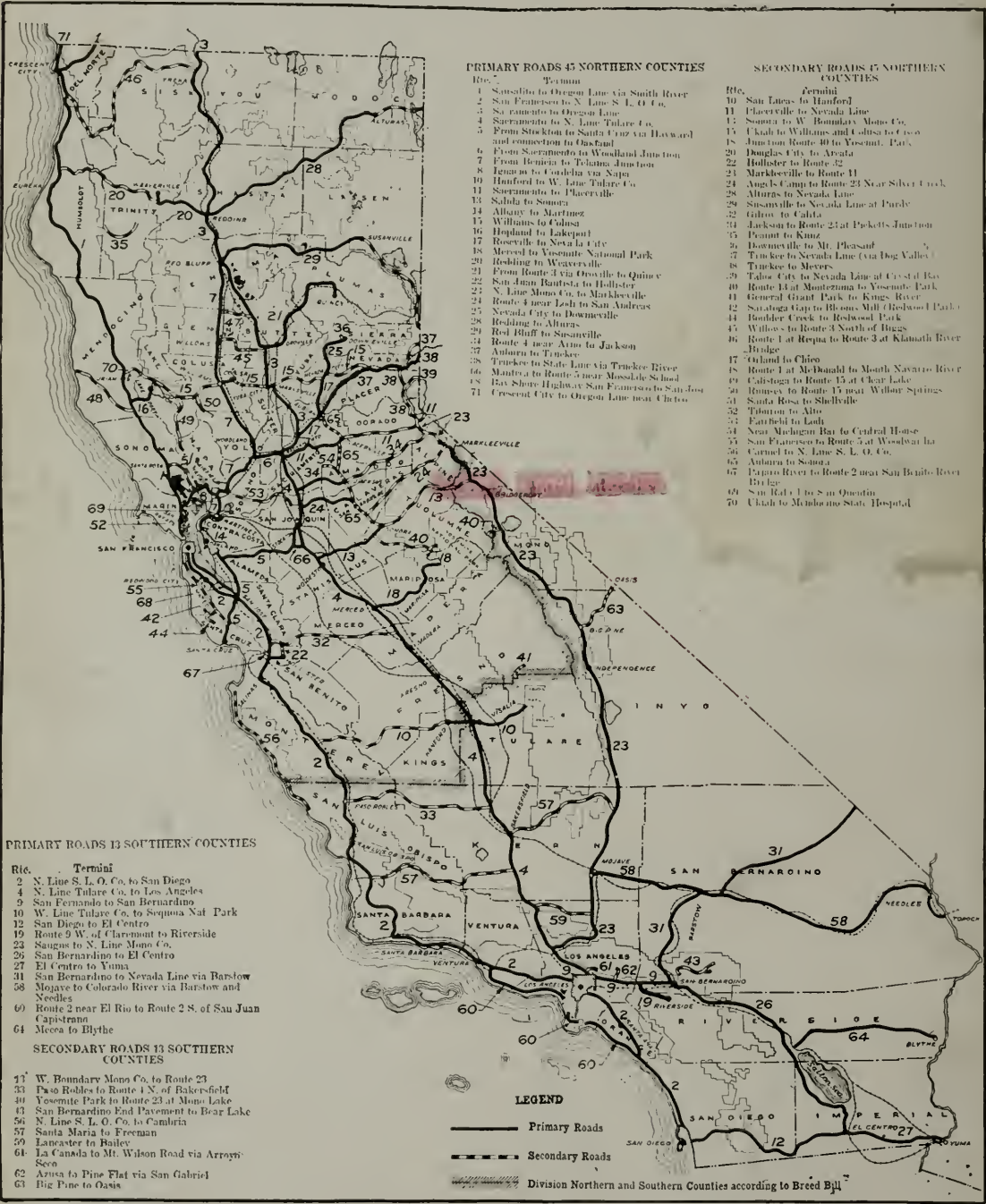
SANTA BARBARA COUNTY—Bet. Ortega Hill and Montecito, 0.3 of a mile grading and paving with Portland cement concrete. Dist. V, Rt. 2, Sec. J. Sam Hunter, Santa Barbara, \$23,987.50. Contract awarded to Cornwall Const. Co., Santa Barbara, \$20,679.75.

SISKIYOU COUNTY—Structural steel and timber sidewalk on existing bridge across Sacramento river near Dunsmuir. Dist. II, Rt. 3, Sec. A. C. C. Gildersleeve, Felton, \$6,269; R. B. McKenzie, Gerber, \$6,622; A. Young, Yreka, \$6,414; M. B. McGowan, San Francisco, \$7,160; J. P. Brennan, Redding, \$7,804. Contract awarded to C. C. Gildersleeve.

TEHAMA COUNTY—A bridge across Paynes Creek about 18 miles east of Red Bluff. Dist. II, Rt. 29, Sec. A. R. B. McKenzie, Gerber, \$8,314; J. P. Brennan, Redding, \$10,122; Harry Porter, Gerber, \$11,016. Contract awarded to R. B. McKenzie.

TULARE COUNTY—Bet. Plaza Garage and Oak Grove School, 2.1 mi. to be widened with Portland cement concrete. Dist. VI, Rt. 4, Sec. D. Lambert & Wood, Fresno, \$25,361; Edgar Noble, Marysville, \$24,530; Valley Paving and Const. Co., Visalia, \$29,310. Contract awarded to C. W. Wood, Stockton, \$23,821.

STATE HIGHWAYS IN CALIFORNIA SHOWING THE PRIMARY AND SECONDARY ROAD SYSTEMS AND THE DIVISION OF THE STATE UNDER THE BREED BILL.



California Highways and Public Works



Official Journal of the Division of Highways
Department of Public Works
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California Highway Expenditures As Compared With Other States

By C. H. PURCELL, State Highway Engineer

THE large sum of money raised for highway purposes through the tax upon gasoline has received widespread attention in California. The need for heavy expenditures for highways if California is to maintain its position among the "better roads" states has received less attention. To accomplish this the funds derived from the present financing system must be carefully conserved and economically expended to assure the proper maintenance, reconstruction and construction of new highways on the present system and necessary roads that may be added.

Comparative state highway expenditure data recently compiled from the 1928 edition of the "Statistical Abstract of the United States," published by the United States Department of Commerce, and from records of the accounting department of the Department of Public Works, State of California, shows California's past and proposed road expenditures to be low in comparison with similar expenditures in other states.

The outstanding fact is that California has been spending considerably less on her state highways than the average in other representative groups of states. Even with the increased funds from the 1-cent gas tax, which are now available, California will continue to expend much less per ear for state highway transportation service than the other states herein referred to.

For the purpose of comparison, several representative northeastern, southeastern and western states have been so grouped that the total area of each group is approximately equal to the area of California. The northeastern group of states comprises New York, Massachusetts, Connecticut, New Jersey, Delaware, Pennsylvania and Ohio. The southeastern group of states comprises Florida, Georgia, South Carolina and North Carolina. The western group comprises Oregon and Washington. Average total road expenditures for the period of 1925 to 1927 inclusive for each group have been compared with similar expenditures in California.

The comparison for each of the sections is shown below in tabular form (for the period from 1925 to 1927, inclusive):

East and California

	Eastern group	California
Land area in square miles----	155,564	155,652
Estimated population, 1928----	38,252,000	4,556,000
Motor vehicle registration, 1927	6,798,715	1,693,195
State highway mileage (Dec. 31, 1926) -----	42,665	6,582
Population per mile of state highway -----	895	692
Number of motor vehicles per mile of state highway-----	160	257
Number of people per car----	5.6	2.7

Annual Expenditures

	Eastern group	California
Average annual state highway expenditures per capita ----	\$4.44	\$3.37
Average annual state highway expenditures per car -----	25.00	9.06
Average annual state highway expenditures per mile -----	3,983.43	2,331.21

South and California

	Southern group	California
Land area in square miles----	192,821	155,652
Estimated population, 1928----	9,416,000	4,556,000
Motor vehicle registration, 1927	1,325,503	1,693,195
State highway mileage (Dec. 31, 1926) -----	23,274	6,582
Population per mile of state highway -----	406	692
Number of motor vehicles per mile of state highway-----	57	257
Number of people per car----	7.1	2.7

Actual Expenditures

	Southern group	California
Average annual state highway expenditures per capita ----	\$7.02	\$3.37
Average annual state highway expenditures per car -----	49.88	9.06
Average annual state highway expenditures per mile -----	2,840.94	2,331.21

West and California

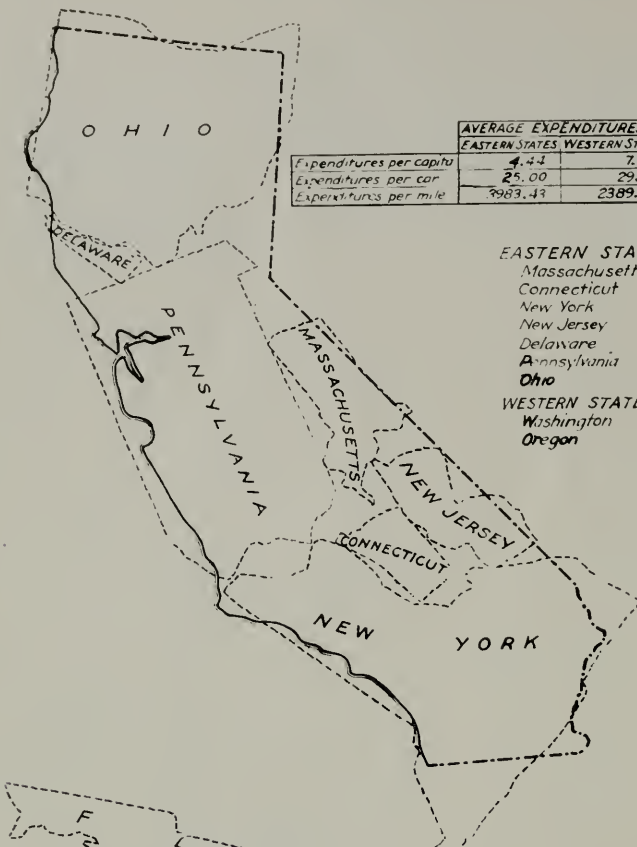
	Western group	California
Land area in square miles----	162,443	155,652
Estimated population, 1928----	2,489,000	4,556,000
Motor vehicle registration 1927	629,155	1,693,195
State highway mileage (Dec. 31, 1926) -----	7,753	6,582
Population per mile of state highway -----	320	692
Number of motor vehicles per mile of state highway-----	81	257
Number of people per car----	4.0	2.7

Actual Expenditures

	Western group	California
Average annual state highway expenditures per capita ----	\$7.44	\$3.37
Average annual state highway expenditures per car -----	29.45	9.06
Average annual state highway expenditures per mile -----	2,389.91	2,331.21

The preceding figures show total expenditures including maintenance and new construction.

The comparison shows that up to the present time the expenditure for state highways



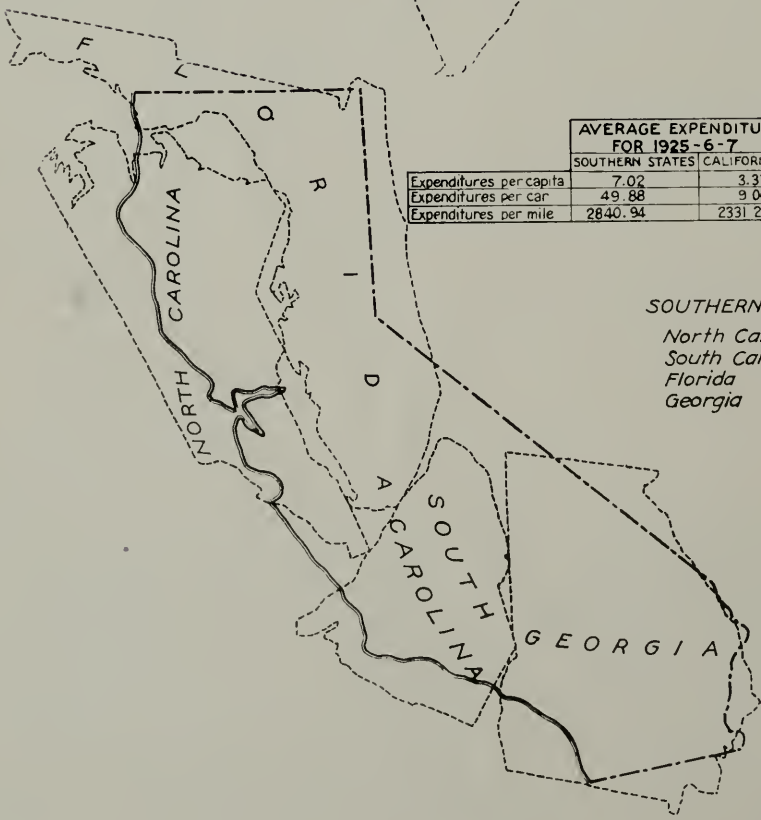
AVERAGE EXPENDITURES FOR 1925-6-7				ESTIMATE FOR 1929
EASTERN STATES	WESTERN STATES	CALIFORNIA		CALIFORNIA
Expenditures per capita	4.44	7.44	3.37	6.59
Expenditures per car	25.00	29.45	9.06	17.72
Expenditures per mile	2983.43	2389.91	2331.21	4559.67

EASTERN STATES

- Massachusetts
- Connecticut
- New York
- New Jersey
- Delaware
- Pennsylvania
- Ohio

WESTERN STATES

- Washington
- Oregon



AVERAGE EXPENDITURES FOR 1925-6-7			ESTIMATE FOR 1929
SOUTHERN STATES	CALIFORNIA		CALIFORNIA
Expenditures per capita	7.02	3.37	6.59
Expenditures per car	49.88	9.06	17.72
Expenditures per mile	2840.94	2331.21	4559.67

SOUTHERN STATES

- North Carolina
- South Carolina
- Florida
- Georgia

in California has averaged less per mile, less per car and less per capita than in the three widely separated representative groups of states compared in the table.

The 1-cent gas tax which was authorized by the Legislature in 1927 will enable California to increase her highway expenditure. With the funds derived from the 1-cent gas tax, California's annual expenditure per capita will be increased to \$6.59 and her annual expenditure per car will be increased to \$17.72. Even with this increase in funds California will continue far lower than the expenditures of the other states referred to herein.

Statistics of the past year's highway activities in all states indicate that the total state highway expenditures in the United States in 1928 of \$1,300,000,000 included an increase devoted principally to maintenance, of \$100,000,000 over the total expenditure of 1927. This indicates that the unit of expenditures under "East," "South" and "West" of the tables will increase subsequently but it must be noted that the proposed per capita and per car expenditure in California during the coming fiscal year are less than the unit expenditure in the other two groups prior to 1927, with one exception. The one exception is that the annually proposed expenditure per capita in California is \$6.59 as compared with the previous expenditure of \$4.44 per capita in the eastern group of states.

In the consideration of highway revenue, traffic needs as compared with the need of traffic of a few years ago must be taken into consideration. Big factors in highway expenditures of today as compared with those of the earlier period are the cost of better alignment and wider rights of way; the heavier and wider pavements now laid; the increasing number of grade separation structures; wider bridges; and the many devices now incorporated into highways to safeguard and accelerate travel that were either unknown or considered unnecessary in the early days of highway building, when traffic was not as heavy as it now is.

STRIPING THE HIGHWAYS

A report has been made from the various districts as to the mileage of pavements which will require striping. It is planned to have all sections of pavement of 20-foot width or more divided into 10-foot lanes. In foggy sections, or where there is danger to traffic, a stripe will be placed along the edge of the pavement. Very favorable comment has been received on those sections of highway where the edges of the pavement have already been so marked. The stripe will be in place before the next winter season to secure the most benefit from the expenditure.

Select Typical Highway Sections For Beautification

Plans for the beautification of typical roadside sections along the state highway system are fast taking form.

Sections in the Sacramento Canyon, and in the vicinity of Roseville, La Honda, Salinas, Serra, and near the Yolo Causeway, as well as a section just south of Merced, have been selected for development as typical sections for roadside beautification. In District VIII different types of trees which thrive under desert conditions are being planted and we are looking into the possibility of improving roadsides along the desert roads with such flowers and shrubs as will grow in that climate. Some fifteen or twenty maintenance stations have also been selected and arrangements are being made for plantings to beautify these places.

In this connection it is interesting to note that California is one of only nine states in the Union with a definite roadside beautification and landscaping campaign under way, financed as legal maintenance expenditures or from special funds. The only other state in the west committed to this program is Oregon, according to data gathered by the California State Automobile Association.

However, the transformation of roadsides by setting out trees, shrubs, and vines, and planting flowers and grasses has developed into a widespread movement in many parts of the country. States ranking with California and Oregon in this work are Oklahoma, Missouri, Michigan, Pennsylvania, Connecticut, Massachusetts and Rhode Island.

In California this phase of highway work is receiving more attention each year. There are some 600 miles of roadsides where trees have been planted, as the work has been under way for a number of years. In addition to this, many of the counties have forestry departments that are taking a decided interest in roadside beautification and are doing systematic planting.

It is believed that nation-wide stimulus will be given to this work as congress last year recognized roadside tree planting as a proper object for federal aid funds. According to Thomas H. McDonald, chief of the bureau of public roads, the amendment to the federal highway legislation providing for participation in planting along the roadside is a forward step and one which will receive the full and earnest support of the bureau.

Governor Young Enunciates Policy of State Highway Extensions

The following message dealing with the policy to be followed in making extensions to the state highway system was transmitted by Governor C. C. Young to the state legislature:

EXECUTIVE
DEPARTMENT

STATE OF CALIFORNIA

March 12, 1929.

*To the Members of
the Senate and the
Assembly:*

In the message transmitted to you at the opening of the present legislative session, and again in the message accompanying the budget, there was discussed the importance of our state highway system to the prosperity and growth of California. In these messages the following statement was made relative to the inclusion of new roads in the state system:

At this time it will be necessary to establish some policy relative to the inclusion of new roads within the state highway system. There is a certain "orphan" section of highway which, by error in description, by oversight, or through other fault, was not included in the state system when the parent roads were designated as state highways. This probably should be annexed to the present system at once. It comprises about five miles. But aside from this I am very doubtful whether other additions can be made just now without disrupting our entire highway program.

There are certain other roads, now a part of county highway systems, that are largely devoted to state rather than local uses. These roads clearly have prior rights to become a part of the state system, when that system is expanded. The question now is as to when such transfer should take place. I would suggest to the Director of Public Works that during the next two years he make a comprehensive traffic study of those county highways in California

TELLS IMPORTANCE OF NEW ROAD POLICY

By C. C. YOUNG,
Governor of California.

The resolution adopted by unanimous vote in both houses of the legislature, dealing with extensions to our highway system, in my opinion is the most important contribution that that body could make to our state highways. It establishes a policy and constitutes a precedent by which future additions to the state highway system must depend upon their ability to qualify for a place in that system upon the basis of merit as determined by and after expert study and investigation.

The legislature is to be congratulated upon its willingness to put the ultimate benefit of the state highway system before the very natural desire of its members to see, included in the system, at this time, roads in which they are particularly and immediately interested.

The resolution not only provides a proper policy to govern extensions to the state highway system, but it also assures a progressive correction of the present unbalanced mileage of the secondary road system in the northern and the southern districts as set up in the Breed bill. This lack of mileage balance constituted a source of irritation and complaint in the south.

The resolution should and will promote state unity and state-wide support in the future and continued development of our highway system.

The appreciative thanks of the people of California are due those organizations and individuals through whose able and loyal efforts this happy result was accomplished.

which now serve as arterial highways, or of routes not now in the state system of probable arterial value, to determine what roads should be added to the system, and the order in which they should be added as determined by state use and traffic needs, together with an estimate of the probable time when such roads can be included in the state system without imposing an impossible burden on that system.

No governor should be asked or expected to sign a bill providing for the extension of the state highway system, except upon recommendation of the Department of Public Works—a recommendation in its turn based upon a careful study of traffic requirements and highway use, in line with the broad general policy of long-time planning. Any other plan will break down our program of highway construction and will savor of political expediency rather than of safe and business-like procedure. Whatever policy may be adopted must be based on traffic and not political pressure.

POLICY FOR INCLUSION OF NEW ROADS

Having thus recognized that there are unquestionably roads which should be added to the state system, and having suggested a study of these roads during the next two years, it becomes necessary to adopt a policy which at the earliest possible moment may afford relief to those localities where county roads, due to the large volume of state traffic using them, have in effect become state roads, thus throwing an undue maintenance burden upon the counties in which these roads lie. It is only

(Continued on page 17.)

Resolution Is Important Step Forward

TEXT OF RESOLUTION

Below is the text of the concurrent resolution introduced by Senator Handy, chairman of the Senate Committee on Roads and Highways, and by Assemblyman Jespersen, chairman of the same committee in the Assembly; passed by unanimous vote of both houses.

WHEREAS, It appears that some highways not now in the state highway system are carrying a volume of state traffic that far exceeds the local traffic carried on said roads, thus placing upon the counties in which these roads are located an undue and heavy maintenance burden; and

WHEREAS, A preliminary investigation by the California Highway Commission and Department of Public Works indicates that there is at the present time a decidedly greater mileage of such roads in the south, as compared with those in the north, carrying this excessive state traffic; and

WHEREAS, An executive message was transmitted to the Legislature under date of March 12 in which was suggested certain underlying principles to be observed in the inclusion of new secondary roads within the state highway system; now therefore, be it

Resolved by the Assembly, the Senate concurring, That the principles enunciated in said executive message be observed in the inclusion of new roads within the state highway system, and that the California Highway Commission and the Department of Public Works be, and they are hereby directed to observe the following principles in the inclusion of new roads within the state highway system.

1. Additions shall during the next two years be made to the present secondary highway system, totaling between 10 and 12 per cent of existing state highway mileage, said mileage to be added in the ratio of not less than three or four miles in the south to one mile in the north.

2. For budgeting purposes this mileage shall be included as a part of the state highway system by the California Highway Commission when the necessary surveys are completed; *provided, however,* no money be expended on same until they have been finally included in the system by legislative act.

3. There shall be no change in the present statutory division of secondary highway funds; and, be it further

Resolved, That the California Highway Commission and the Department of Public Works be and they are hereby directed to make a careful study of the state highway system to ascertain and determine routes not now in the system which, either by reason of the large volume of state traffic that they are now carrying, or by reason of the relief that they would afford to heavy traffic upon present state highways, or as highways serving as important interstate links, might properly be included and added to the state highway system; and be it further

Resolved, That this study shall, in accordance with the above mentioned executive message, include an investigation into the engineering, economic and traffic facts involved in the matter; that a comprehensive

report shall be made to the forty-ninth Legislature embodying such recommendations as the investigation may disclose as proper and a recital of such facts as may have been taken into account; that this investigation shall begin not later than May 1, 1929, and that this report shall be completed and made public not later than August 1, 1930, and that pending the adoption of such report authority be hereby given to the California Highway Commission to take into consideration for its next budget such roads as it is thus designating and bringing to the attention of the Legislature at its next session.

By B. B. MEEK,

Director of the Department of Public Works

THE resolution represents an agreement between the varying opinions of the north and south relative to the additions of new roads to the state highway system.

Opinion in the north has been consistently against any considerable addition to the state highway system until further progress is made in completing the roads to which the state is now obligated. The north has felt that the distribution of the same amount of money now allotted to secondary roads in the north over a larger mileage than is now in the north's secondary system would only serve to delay needed construction and improvements of present state highways.

The resolution protects these northern roads in their money allotments. At the same time sufficient leeway is left to permit the inclusion in the northern system of such roads as may obviously be now performing the service of state highways and entitled to a place in the state system.

The mileage in secondary highways in the southern group of counties is 525 as compared with the secondary mileage of 1778 in the north. In the south the situation has also developed that a number of county roads are now carrying a large volume of traffic of a statewide character and a relatively small volume of local traffic. The extent of this traffic is such that it makes it difficult and in some cases impossible to maintain an adequate surface upon this road. This situation has resulted in placing upon the counties in which these roads are located a heavy and at the same time an unfair maintenance burden.

The resolution permits the inclusion of such roads as investigation may show are now carrying a preponderate state traffic, and in a

(Continued on page 10.)

The Semi-Annual Traffic Count

PARAPHRASING the well known words of Diamond Jim Brady that "Those that has 'em, wears 'em" to "Those that has 'em, drives 'em" was amply corroborated by the traffic census taken at various stations throughout the state on January 13 and 14. With the weather generally unfavorable, the returns still indicate a healthy increase over last year's count for a similar period.

Substantial gains were noted in the main north and south interstate connection and recreational routes. The increase in the latter type is of particular interest, typifying the initiation of a new form of recreation. These routes are, in the main, feeders to the high Sierra passes which are usually closed by snow a short distance above the foothills. However, the gradual improvement of these routes to the snow line elevation places the invigorating sports of winter within a few hours' drive of the valley areas. The growing popularity of this movement is well attested by the 4 per cent increase over last year's count, which itself represented a 51 per cent advance over that of the previous year.

The present count is in line with the policy initiated in 1920 as a means of determining not only traffic service, but also the allotment of construction and maintenance expenditures, as well as type and design of road section. At its inception 103 stations were selected as expressive of the traffic flow, which number has since been increased to some 836 stations.

Consecutive counts are taken over two-day periods bi-yearly between the hours of 6 a.m. and 10 p.m. Sunday and Monday are usually selected as typifying the daily variation; the seasonal being obtained by taking the count during the mid-month periods of January and July.

In the count vehicles are segregated in hourly periods over the following classifications: Passenger cars, light trucks (loaded and empty), heavy trucks (loaded and empty), horse-drawn vehicles, trailers, buses and foreign cars, that is cars registered outside the state. In the present census in the vicinity of large population centers an account was registered of the directional flow of traffic. In some instances this variance in direction was in the proportion of 75 per cent and 25 per cent. However, the relation for the full day count was in most cases approximately equal.

This information is very important, as it plays a direct part in the establishment of road widths which are predicated on peak hour traffic.

As a matter of interest, certain salient points have been selected on the various routes for the purpose of comparing counts taken this year on January 13 and 14 with those taken in 1928 over a similar period. The present census, based on the locations enumerated, show the following increases:

	For Sunday Pct.	For Monday Pct.
Main north and south routes-----	+12	+ 7
Laterals between inland and coast routes -----	+ 6	+ 6
Interstate connection routes-----	+20	+ 6
Recreational routes -----	+ 4	— 5
Miscellaneous -----	— 4	— 8
Average of all routes-----	+ 8	+ 4

Route No.	Sunday Gain Pct.	Loss Pct.	Monday Gain Pct.	Loss Pct.
1. San Francisco to Oregon line---	4	--	10	--
2. San Francisco to San Diego-----	11	--	6	--
3. Sacramento to Oregon line via Marysville -----	--	--	--	4
4. Sacramento to Los Angeles (Val- ley Route) -----	--	1	1	--
5. Stockton to Santa Cruz via Oak- land -----	11	--	5	--
6. Sacramento to Woodland Junction	--	15	--	10
7. Tehama Junction to Benicia-----	--	1	7	--
8. Ignacio to Cordelia via Napa---	--	13	--	3
9. San Fernando to San Bernardino	29	--	20	--
10. San Lucas to Sequoia National Park -----	--	2	10	--
11. Sacramento to Riverton via Pla- cerville -----	--	14	--	17
12. San Diego to El Centro-----	78	--	20	--
13. Salida to Sonora -----	--	--	--	1
14. Albany to Martinez-----	--	9	3	--
15. Route 1 near Calpella to Grass Valley -----	2	--	--	18
16. Hopland to Lakeport-----	2	--	16	--
17. Roseville to Nevada City-----	2	--	--	17
18. Merced to El Portal-----	22	--	--	4
19. Route 9 west of Claremont to Riverside -----	8	--	--	8
20. Redding to Route 1 near Arcata -----	6	--	26	--
21. Route 3 near Richvale to Quincy	51	--	58	--
22. San Juan Bautista to Route 32 via Hollister -----	--	1	--	4
23. Saugus to Bishop -----	39	--	30	--
24. Route 4 near Lodi to Valley Springs -----	--	24	--	2
25. Nevada City to Downieville---	77	--	29	--
26. San Bernardino to El Centro---	44	--	28	--
27. El Centro to Yuma-----	13	--	--	1
28. Redding to Nevada Line via Al- turas -----	32	--	15	--
29. Red Bluff to Nevada Line via Susanville -----	58	--	29	--
31. San Bernardino to Jean-----	14	--	22	--
32. Route 4 near Califa to Route 2 at Gilroy -----	8	--	29	--
33. Route 4 near Bakersfield to Paso Robles -----	15	--	10	--
34. Route 4 near Arno to Pine Cove -----	--	3	--	3
37. Auburn to Colfax -----	28	--	--	37
43. San Bernardino to Big Bear Lake -----	91	--	--	15
44. Boulder Creek to Redwood Park	32	--	32	--
47. Orland to Chico-----	--	--	32	--
48. McDonalds to Wendling-----	27	--	10	--
49. Calistoga to Lower Lake-----	--	1	--	--

(Continued on page 24.)

Interpreting the Traffic Census

By T. H. DENNIS, Maintenance Engineer

THE purpose of the maintenance organization is to serve traffic. To fulfil this obligation the highways must not only be preserved in the best condition, but information as to the rate of development of traffic must be collected so that expansion of transportation facilities will be just ahead of traffic needs. With this end in view the maintenance department has made a special study of the traffic problem during the past two years.

While traffic counts taken each year in January and July provide records of existing traffic, any worthwhile recommendation requires an approximate determination of the traffic capacity of two, three, and four lane pavements, also an estimate of the probable increase in traffic on any given section of road.

On every heavily traveled road there is a period in the morning and late in the afternoon when travel is heaviest. Our analysis of actual hourly records for all sections of the state showed that for nearly 90 per cent of the stations the traffic during the peak hour was from 9 to 11 per cent of the total traffic from 6 a.m. to 10 p.m. For practical purposes the peak hour traffic may therefore be accepted as 10 per cent of the 16-hour count.

The next step was to determine the volume of traffic which might use the highway during the peak hour without undue interference. This quantity is influenced by a number of variables, such as condition of the road, alignment, intersections, range in braking distances, percentage of fast and slow vehicles, personal equation of each driver, etc. It is evident, therefore, that any figure adopted must be based on arbitrary assumptions. In making such assumptions in our study, consideration has been given to records of actual performance, experience and observation. There are shown three tables which give the basic assumptions. Table I shows the number of vehicles which can pass over a single traffic lane at uniform rates of speed. In this table full braking distance is provided between each vehicle. The capacities shown permit 100 per cent safety for each vehicle.

Table II shows what may be considered as the maximum capacity of a single traffic lane with all vehicles uniformly spaced and traveling at a uniform speed. No allowance is

made here for braking distance. Table III is a combination of Tables I and II and represents an average volume at given uniform speeds. The capacities shown in these three tables are working capacities on the assumption that the opposite lane of the roadway is filled so there is no opportunity for passing and all vehicles are thus held at the speed of the slowest vehicle in the line.

The planning for pavement width to care for the estimated future traffic requires that the traffic capacity be taken at some definite figure. The range of driving speeds and other factors is so great that practical working capacities vary widely. At the expense of police control, increased danger of accidents and of delay, expense and inconvenience to users of the highways, traffic of 2000 vehicles per hour may be passed over a single lane roadway at twenty to twenty-five miles per hour. However, a single vehicle traveling at a speed of two miles per hour would reduce the capacity of our single lane to 330 vehicles per hour. At fifty miles per hour it is theoretically possible to pass 2400 vehicles per hour over this single lane in the same direction.

Alignment, gradient, proportions of light and heavy traffic, weather, driving conditions, and the personal equation of different drivers all enter into the question of establishing a guide for the proper economical planning of roads for maximum service. The maintenance department has carefully considered these different phases of the problem in the light of traffic records and actual field conditions, and has arrived at the following capacities for the purpose of determining the width of pavement necessary to care for the estimated traffic in 1940:

	<i>Vehicles per hour</i>
Two-lane roadway -----	700
Three-lane roadway -----	2000
Four-lane roadway -----	3200

These are considered to be the peak hour traffic figures and represent 10 per cent of the traffic for the sixteen-hour period from 6 a.m. to 10 p.m. This volume of traffic will permit fast traffic to travel at 40 miles per hour and provides for sufficient safe passing space for that purpose. It provides for a safety factor of about 30 per cent, that is: Traffic on a two-lane roadway can be increased to 1000 vehicles

per hour without serious delay. An explanation of the method of arriving at those figures is given below:

For Two-lane Road.

Rate of traffic flow, with minimum delay, was determined under the worst and also the best combination of vehicle spacing and speeds. Graphs No. 1 and No. 2 were worked up to show these conditions. These graphs show the relative positions of the vehicles on a mile of two-lane roadway at each second of a minute interval of time.

Graph No. 1 shows a number of fast and slow vehicles equally divided as to direction of travel. At zero time vehicle No. 2 is just

in position to turn out to pass No. 1 and Vehicles No. 3, No. 4 and No. 5 are spaced at the closest interval so that no delay results as they continue their uniform speed. At the forty-eighth second, vehicles No. 2 to No. 5, inclusive, have completed their passing. At these speeds one-half mile of road is required to complete the passing without delay. In the meantime a similar spread of vehicles can be approaching from the opposite direction on the other lane with their passings complete in the same time interval. Vehicles No. 6 and No. 16 were then spotted at a spacing to give the least possible delay. It will be noted that these two vehicles must reduce speed at the fifty-eighth second because vehi-

TABLE I—MINIMUM CAPACITY—ONE LANE

Miles per hour	(1) Braking distance (feet) (safe all grades to 6 pct.)	(2) Reaction time in seconds	(3) Reaction distance plus 17 ft. (from table II)	Spacing of cars, sum of (1) and (3)	Cars per mile	Capacity per hour
2-----	0.6	1.000	31.7	32.3	163.5	32.7
10-----	12.5	1.000	31.7	44.2	119.5	1195
15-----	28.0	.938	37.6	65.6	80.5	1207
20-----	50.0	.875	42.6	92.6	57.0	1140
25-----	78.0	.812	46.8	124.8	42.3	1057
30-----	112.0	.750	50.0	162.0	32.6	978
35-----	153.0	.688	52.3	205.3	25.7	900
40-----	200.0	.625	53.7	253.7	20.8	832
45-----	253.0	.562	54.1	307.1	17.2	774
50-----	312.0	.500	53.7	365.7	14.4	720

TABLE II—MAXIMUM CAPACITY—ONE LANE

Miles per hour	Velocity feet per second	Reaction time in seconds	Reaction distance in feet	Reaction distance plus 17 feet	Cars per mile, one lane	*Capacity per hour
2-----	3.0	1.000	14.7	31.7	166.6	333
10-----	14.7	1.000	14.7	31.7	166.6	1666
15-----	22.0	.938	20.6	37.6	140.4	2106
20-----	29.3	.875	25.6	42.6	123.9	2478
25-----	36.7	.812	29.8	46.8	112.8	2820
30-----	44.0	.750	33.0	50.0	105.6	3168
35-----	51.3	.688	35.3	52.3	100.9	3531
40-----	58.7	.625	36.7	53.7	98.3	3932
45-----	66.0	.562	37.1	54.1	97.6	4392
50-----	73.3	.500	36.7	53.7	98.3	4915

*Number cars passing given point.

TABLE III—AVERAGE CAPACITY—ONE LANE

Miles per hour	Cars per mile, 40 pct. of maximum, Table II	Cars per mile, 60 pct. of minimum, Table I	Cars per mile	Spacing, feet	Capacity
2-----	66.6	98.1	164.7	32.0	329
10-----	66.6	71.7	138.3	38.2	1383
15-----	56.2	48.3	104.5	50.5	1567
20-----	49.6	34.2	83.8	63.0	1676
25-----	45.1	25.4	70.5	74.9	1762
30-----	42.2	19.6	61.8	85.4	1854
35-----	40.4	15.4	55.8	94.6	1953
40-----	39.3	12.5	51.8	101.9	2072
45-----	39.0	10.3	49.3	107.1	2218
50-----	39.3	8.6	47.9	110.2	2395

cles on the opposite lane prevent free passing. The addition of a single additional vehicle at any point will cause additional delay. This graph shows minimum delay and speed conditions which require maximum distance for passing. Twenty-four passings are made by 12 machines in the minute interval on the mile of road. The rate is 340 vehicles per hour.

Graph No. 2 shows a more nearly normal spread of fast and slow vehicles under the best passing conditions; 16 passings are made by 28 machines per minute on the mile of road. The rate of flow is 1035 vehicles per hour. The average rate of flow shown by the two graphs is 688 vehicles per hour.

Three-lane Road.

Under the best conditions a three-lane road is capable of carrying twice the capacity of a two-lane road, or 2000 vehicles, as the center lane is available alternately for fast traffic from either direction and the average speed would, therefore, be considerably higher than that of the slow vehicles. The inner lane is available to full capacity for 40 mile per hour traffic, or 2072 vehicles, with a minimum of possibly 10 per cent additional on each of the outside lanes, or a total of 2500 per hour. It is considered that 2000 vehicles per hour during peak hours would be a reasonable capacity.

Four-lane Road.

With four-lane traffic, under proper police regulation, the outside lanes carry the slow moving traffic and the inside lanes the fast traffic. Under these conditions the two inside lanes will carry 4144 vehicles at 40 miles per hour, according to Table III. With a minimum of 10 per cent additional for the slow traffic on each of the outer lanes, a peak hour traffic of 5000 vehicles should be possible under well controlled conditions and our assumption of 3200 as a working basis is considered a comfortable peak capacity.

Consideration was also given to rate of traffic increase. This is dependent on increase in population, increase of vehicles in proportion to population, increase in traffic from outside the state, and increased use of vehicles as the highways are improved. For our purposes, after analysis of existing data in the above respect, it seemed reasonable to assume that the increase in traffic would continue at the present rate of nearly 9 per cent annually for the next 12 years without extreme change. Traffic assumptions as of 1940 were worked out on an average of 9.6 per cent annually over the 1926 count.

RESOLUTION IS IMPORTANT STEP FORWARD

(Continued from page 5.)

ratio that will tend toward establishing a balance between the secondary highway mileage north and south.

It will be noted that the resolution is confined to secondary highways. Primary highways are not affected by it. Under the Breed bill the secondary highway funds are divided on a 50-50 basis between the north and south. The resolution affirms this distribution.

The resolution also protects the highway system against an undue inflation of mileage by limiting the inclusion of new roads in the next two years to from 10 to 12 per cent of the present mileage in the state highway system.

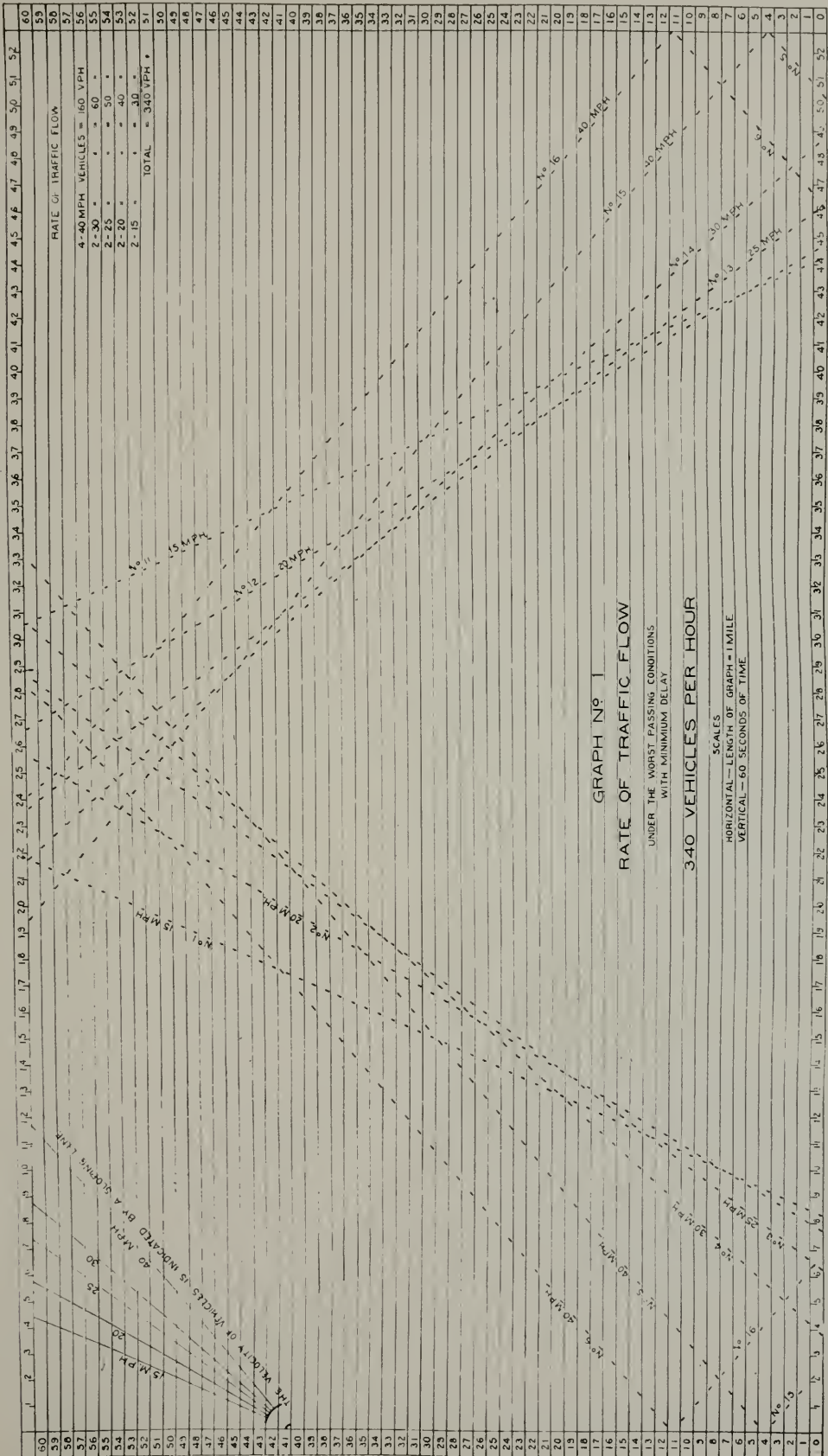
As far as the present administration is concerned, we feel that this resolution is most important in that it marks the definite establishment of the principle that additions to the state highway system shall follow, and not precede, an expert study by the state road building authorities of roads proposed for inclusion in that system. It means the end of the designation of state highways with necessary engineering knowledge. It marks a contribution to the highway system of California as important as was the substitution of the pay-as-you-go plan for the costly system of payment through bond issues. I feel that the Legislature will perform a very signal service for the state in the adoption of this resolution.

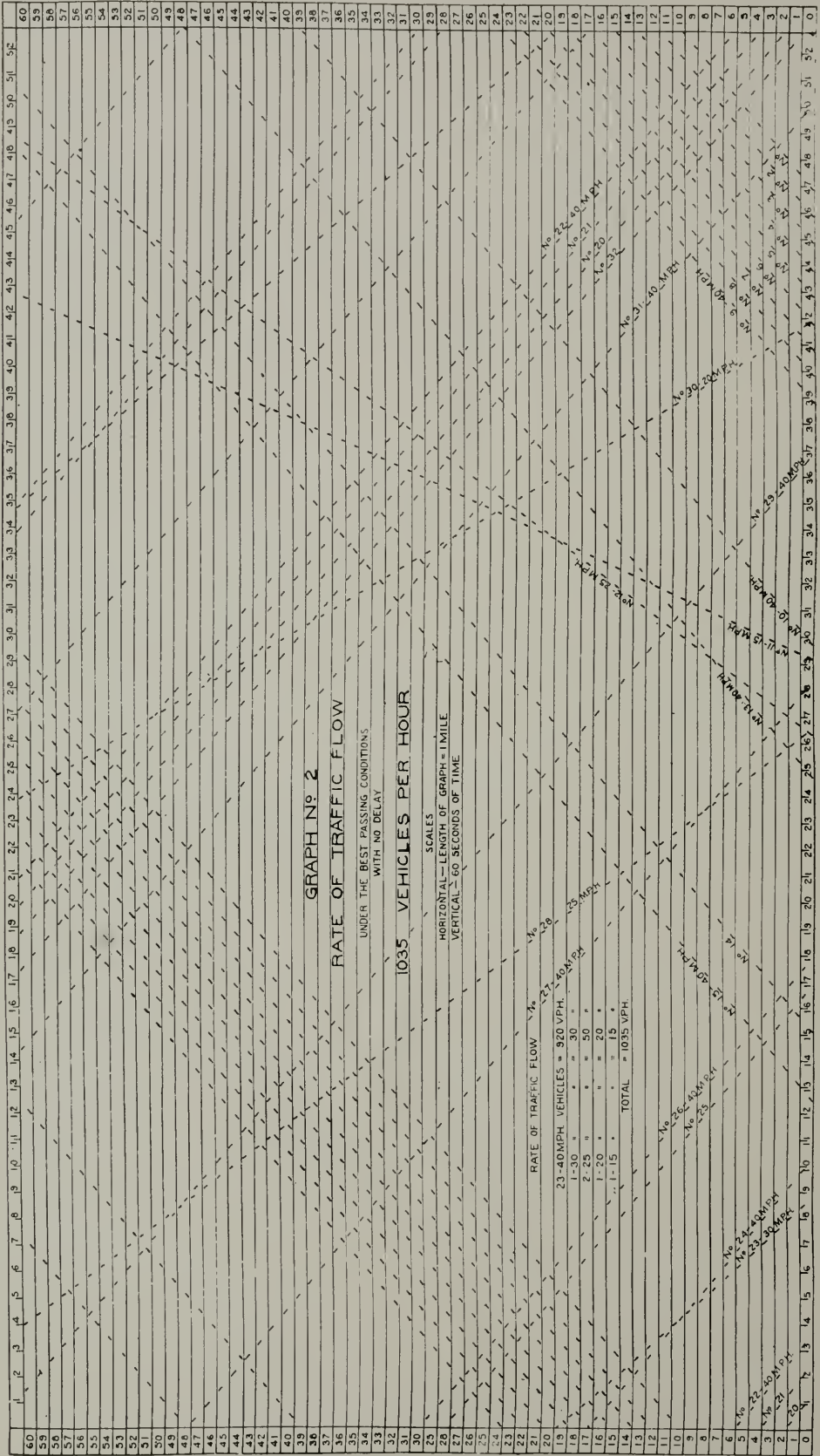
CONNECTICUT—Accident reports for several years indicate that less than 4 per cent are due to defects in the vehicle.

VERMONT—Snow removal service last winter was extended over 1702 miles of state highways, or slightly less than one-half the mileage.

The information developed was applied in a practical manner, as shown by the accompanying typical chart. This chart shows the 1926 peak hour traffic; the estimated peak hour traffic of 1940, and the annual maintenance costs per mile of the various types of pavement, as well as the pavement and shoulder widths on a given section of highway.

Similar charts have been prepared for the entire state highway mileage and represent a summary of pavement types, maintenance costs and traffic records and needs, which makes this information easily available for analysis in connection with planning improvement in the work of the maintenance department.





Fighting Floods With Sacked Concrete

By C. H. WHITMORE, District Engineer

SHIVELY BLUFF in Humboldt County on the Redwood Highway has been the source of extreme trouble either from slides or from the wash of the Eel River on the embankment side of the roadway.

The spring of 1928 found the roadway at this point washed out until two cars could not pass. (Shown in picture 46.)

Embankment quantities were computed and it was found that about 8500 cubic yards of material were necessary to fill out the roadway to its standard width, and a study of the cut side revealed the fact that probably 100,000 cubic yards would have to be moved to get the roadway to a cut section which would be safe. This would also open up a new face, probably 100 feet high, which would cause many new slides.

Various methods of repair were considered but finally it was decided to refill the embankment which had been washed out and protect it against the river which rises, in flood times, about 25 feet and carries very heavy drift.

As the season was getting late, the proposition of filling the embankment and slope paving was abandoned in favor of sacked concrete rip rap, as high water might be expected at any time and with the use of the latter method, the fill and the rip rap protection could be brought up at the same time.

Accordingly, a trench was dug about two feet deep in bed rock at the cross-sectioned toe of fill, the first sack laid lengthwise, and the second row placed crosswise, to render better stability to the footing. The third row, as well as the balance of the rows for the entire height, was placed lengthwise again or parallel to the grade.

Previous experience has shown that a better bond can be secured by lapping the sacks to approximately half their width, which gives about a 1:1 slope to the finished wall.

The wall should be brought up in sections and as the concrete is mixed comparatively wet, the handling of the sacks promotes a kneading action which brings a film of grout to the outside of the sack, promoting a permanent bond between sacks when laid. When a row has become set, before the succeeding row is placed, a trench about eight inches wide, dug immediately behind the "cold" row, should be filled with green concrete.



Top view, highway as washed out; middle view, the first tier of sacked cement, view of sacked embankment; filling in back of the sacks; lower view, the widened highway.

Slope boards should be constantly employed to keep the slope true to line and care must be exercised to keep the rows from working out as wheeling over them tends to "mush" them towards the outside. Changes in slope tends to create knuckles which might cause trouble later when the green fill settles.

Two mixers were set up on grade, and a hopper built immediately below the mixer where two men load sacks with concrete, tie them and shoot them to the wheelers and placers below by means of troughs. From this point they are wheeled in wheelbarrows to the point of placing. This is accomplished on top of two-inch boards laid on the newly placed sacks.

The fill was brought up with the assistance of a team and Fresno. At this point the concrete work was shut down until the embankment was caught up.

This rip rap was 370 feet long and 25 feet high, being "toed in" to the old ground on either end.

Five hundred and fifty cubic yards of concrete were mixed and placed at a cost of \$9.50 per cubic yard. One cubic yard covers approximately 2.7 square yards of surface so the cost per square foot is \$.35.

The sand and gravel was hauled from a river bar by a 1½ cubic yard truck and dumped at the mixers close enough so that it would be shoveled directly into the skip, proportioning by shovel counts, so no wheelbarrows were necessary. Material was loaded from the bar from a one-man gravel plant consisting of a small hoist and bucket which dragged the material up a runway and dumped into a loading box so there was no lost time for the trucks.

About 20 to 25 cubic yards per mixer per day should be averaged, depending on the amount of mechanical trouble.

Mixing water was furnished from a pipe line and small pump set on the river bank.

Ordinary small grain, potato or small sugar sacks which have an open mesh are used. Sacks are tied with wire and tied close to the concrete so that a maximum rise per sack may be obtained when they are placed in the row.

This rip rap has stood over the winter and has two small slips in it, both of which would not have happened had the above directions been followed more closely. However, high water has been above these slip points twice with no damage to the work, and the slips can be repaired at nominal cost.

This work was designed and construction supervised by Richard H. Wilson, District Maintenance Engineer.

Grade Crossing Accidents Show Decrease in 1928

There were 2179 grade crossing accidents in California during 1928, according to a report just compiled by the Transportation Division of the Railroad Commission. This was an increase of nearly 25 per cent over 1927, when there were 1740 accidents, and a still greater increase over 1926, when there were 1217 accidents.

The number killed in grade crossing accidents in 1928 was 165, as against 194 in 1927, and 139 in 1926. The injured numbered 732 in 1928, as against 763 in 1927, and 629 in 1926. It is apparent, therefore, that while there were more accidents in 1928 than in 1927, the death rate and the number of injured was less than in the previous year.

These figures must be considered, the report points out, together with the figures for the motor vehicle registration during the same years. The total number of all motor vehicles registered in California in 1928 was 1,822,262, while in 1927 it was 1,702,639, and in 1926 it was 1,610,770.

Los Angeles County, which has the largest number of motor vehicles registered, as well as the largest number of grade crossings, of any county in the state, led in grade crossing accidents, and in killed and injured therefrom. The figures are as follows: Number of accidents in 1928 was 843; number of killed 48; injured 285. In 1927 there were 759 accidents, 64 killed and 294 injured. In 1926 there were 422 accidents, 47 killed and 314 injured.

Alameda County was second in the statistics with 562 accidents in 1928, in which 23 were killed and 107 injured. In 1927 there were 295 accidents, with 20 killed and 129 injured, while in 1926 there were 207 accidents, 10 killed and 79 injured. Santa Clara County was third with 123 accidents in 1928, with 9 killed and 29 injured. San Joaquin County had 66 accidents in 1928; Fresno had 56 accidents; San Bernardino County had 55; Orange County, 46; Tulare County, 31; Kern County, 30; Sacramento 47; and other counties recorded accidents in approximately the ratio of their population.

Approximately 27 per cent of the grade crossing accidents during the last three years resulted from vehicles running into standing or moving trains.

The increase of accidents during the last two years, occurring on double track crossings is apparently due to the growing tendency of impatient drivers to proceed over crossings as soon as the first train has cleared, without knowing whether or not a train is approaching on the second track, with the result that the vehicle is struck by a second train from the opposite direction.

Suggestions are made for the installation of a special signal announcing the approach of a second train at double track crossings, for the purpose of reducing these accidents.

A large percentage of the accidents occurred at grade crossings protected by wig-wags and also by human flagmen.

More than 75 per cent of the grade crossings in the state are now protected only by crossing signs, and that the crossings protected by human flagmen or wig-wag signals are the more important ones, and carry a considerable volume of vehicular traffic.

December is the month of most accidents, while May has the least. October shows the largest num-

(Continued on page 23.)

New Signs Reduce Hazard at Road-Railroad Crossings

PENDING the completion of the program of the California Highway Commission for the elimination of railway grade crossings upon the state highway system, plans have been perfected by which the hazard of remaining grade crossings will be greatly reduced.



Plans for a new system of marking grade crossings have been perfected by T. H. Dennis, Maintenance Engineer, acting under the direction of C. H. Purcell, State Highway Engineer. The new devices are now being given their first tryout.

For the most dangerous crossings where there is a large train movement, the crossings are to be marked with Neon signs set from poles over the center of the highway with a 14-foot clearance. These signs are visible in a level country for 3 miles and can be easily read at a distance of 1500 feet. They bear the familiar warning R X R, where the railroad crosses at right angles with the highway a two-faced sign is installed immediately above the crossing. Where the highway turns to cross the railroad the sign is installed before the turn with a line and arrow indicating its

direction. These signs bear two large letters with the "X" 36 inches in height. The sign itself is 3 feet, 6 inches in height by 8 feet in length.

For crossings where the train movement is not so large a railroad sign 10 feet in length by 3 feet in height is being tried out. This is illuminated by reflected lights, and is visible for a long distance. It is installed approximately 400 feet from the crossing. Where the highway bends to cross a railroad, the point where the road turns is marked by an arrow, which is in its turn illuminated by reflected lights.

A third plan which is yet to be tested out provides for the better illumination of railroad grade crossings by spot lights, attached to neighboring poles.

Stanton Named as Committee Chairman

T. E. Stanton, material and research engineer of the Division of Highways, has been appointed chairman of the newly created western section of the committee on materials, American Association of State Highway Officials.

Other members of the committee are as follows: N. M. Finkbiner, engineer of materials, State Highway Commission, Salem, Oregon; Raymond Harsch, materials engineer, bureau of highways, Boise, Idaho; Levi Muir, Jr., materials engineer, State Road Commission, Salt Lake City, Utah.

In making the appointment, Mr. Mattemore, chairman of the general committee on materials, wrote Mr. Stanton as follows:

"The question of active participation of the Western States in the work of the committee on materials has given us some concern in the past. We feel that these states should be actively represented on our committee, but recognize that due to the distance it is seldom possible for any of the members to attend the meetings of the committee. It was for the purpose of stimulating interest in our work that the western section was organized, the idea being that this section could meet as a unit from time to time for the purpose of discussing methods of tests and specifications with special reference to conditions in the West."

After centuries of use of the left hand side of streets for traffic, Australia has decided to follow the United States and adopt the right hand side. The change will involve an expenditure of \$2,100,000, since the government will have to change thousands of signals.

Detroit has a new plan for sidewalk zoning. Sidewalks on the chief shopping avenue are marked off into three lanes—one for northbound pedestrians, one for southbound, and an inside lane where window-shoppers can loiter as much as they like. At street intersections painted footprints direct people into the right lane of traffic. The plan was first installed for the Christmas shopping season, and met with such success that it is to be adopted permanently. The experiment has resulted in greater ease and speed, as well as greater safety for bundles, purses, and persons.



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Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

B. B. MEEK.....Director
GEORGE C. MANSFIELD.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

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DIVISION OF HIGHWAYS DEPARTMENT OF PUBLIC WORKS STATE OF CALIFORNIA

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B. B. MEEK, Director, Department of Public Works
CORNING DE SAULES, Deputy Director, Department of Public Works
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General Headquarters, Third Floor, Highway Building,
Eleventh and P Streets, Sacramento, California

English Bumpy But Better than We Could Do in German

Letters regarding California's highways pour into the office of the California Highway Commission from all parts of the world. Here is one recently received from Königsberg, Prussia:

Königsberg i/ Pr, 12th of January 29
The State Highway Commission,
Sacramento, California
U. S. A.

Dear Sirs,

Elaborating a research on the economical efficiency of new highways for motoring, which are to be built in East Prussia. I lack materials about the rentability of such highways in U. S. A., which are known the bests the world over.

I should be very much obliged to you for communicating me the experiences you made in your state about this matter, namely: american motor highways were they built to open regions of great picturesque beauty and to be visited by tourists? did their construction cause the fondation of new settlements (towns, villages, hotels) still in prosperity? what is the sort of construction which gave the best effects and how elevated were the costs? and finally: who gave the money to construct them and what may be considered as the principal advantage they gave to the country?

If their are books or printed artikles about the question, please, indicate me the title and where I can get them. You will render a great service to my work so useful for the development of this country by answering my questions. My professor at the Commercial academy of Königsberg, Mr. Rogowsky, will be very grateful to your precious concurrence.

Trusting to receive as soon as possible your kindly reply I am with my heartily thanks

Yours truly

[Name omitted]
Samlandweg 8
Königsberg i/ Pr
Germany

LITIGATION SETTLED

On August 1, 1928, bids were opened for constructing an overhead crossing of the Southern Pacific Railroad tracks at Sargent in Santa Clara County. After the contract was awarded and before the contractor could start work, the property owners secured an injunction to prevent the construction of the overhead crossing. After long drawn litigation in the courts the matter has now been satisfactorily adjusted and it is expected that the contractor will start work immediately.

NEW MEXICO—Reconstruction of all state highway curves to make them safe at 35 miles per hour has been ordered. Curves designed for slower speeds are considered traffic hindrances requiring immediate attention.

GOVERNOR YOUNG ENUNCIATES POLICY OF STATE HIGHWAY EXTENSIONS

(Continued from page 4.)

fair and proper that this situation be corrected through a gradual expansion of our secondary road system.

Accordingly I would suggest that by resolution the Legislature direct that a study of this problem be immediately begun in order to determine:

(1) Roads not now in the state highway system, which, in the opinion of the California Highway Commission and the Department of Public Works, should properly be included in it;

(2) The extent to which there is a lack of balance which prevents a well-ordered and unified system, and the manner in which such lack of balance may be corrected;

(3) A study of the state highway system, which will give information regarding the cost of bringing the system up to a stage where traffic on our highways is adequately and economically served;

(4) The extent to which highways may be added in the next two years to the state system without unduly jeopardizing existing and future maintenance and construction funds; and

(5) Some method by which these maintenance and construction funds may as soon as possible be made available for the new roads that may be added to the state system.

I think we would all agree that, considering the many hundred miles of unimproved and undeveloped roads in our existing state highway system, we should not add new roads to that system in any careless or haphazard way. I think we would agree that before a road is added a traffic and economic study should determine its necessity, and a survey as to rights of way, grades, economy of construction, and the like, should determine its location.

I think we would also agree that new roads should not be added more rapidly than they can be adequately cared for. Money spent on these new roads can be expended only on the theory that they are more immediately important to the state than other roads in the existing system whose development might thereby be postponed. I am of the opinion that the California Highway Commission and the Department of Public Works are justified in their belief that at the present time a mileage increase of approximately 10 to 12 per cent, or between 650 and 800 miles, is about all the system can safely stand.

NECESSITY OF EQUALIZING SECONDARY MILEAGE

I think we would agree that in developing our highway system we must do justice to all sections of the state. The Breed law, in allocating gas tax funds, proportioned the amounts given to primary roads in the northern and the southern portions according to the primary mileage in these two sections, these being roads of state-wide interest and importance. For the secondary roads, however, an equal amount of funds was given to the north and to the south. I believe that the best interests of the state will be served by maintaining this equality of allotment.

However, the present highway system as built up during previous administrations included only 525 miles of secondary roads in the southern counties as against 1778 miles in the north. This means that whereas the north has 1778 miles over which to spread its allotment of secondary highway funds, the south has only 525 miles on which to use an equal allotment, thus requiring that, until this lack of balance is adjusted by taking in other roads which may qualify for a place in the state system, there must be an uneven development of the secondary system in the two ends of the state.

No one, I am sure, would wish to disturb the equal allotment of funds to northern and to southern secondary roads. It is obvious, therefore, that an unsatisfactory condition will exist until the present great disparity in secondary mileage is reduced. The Highway Commission assures me that on the basis of preliminary investigations it is also obvious that, in the 10 to 12 per cent increase referred to above, they must of necessity recommend the addition of three or four times as much mileage in the south as in the north. This addition will be confined to the secondary system and by so doing it will more nearly equalize the secondary mileage in the state.

UNDISPUTED FAIRNESS OF SOUTHERN POSITION

I have noted certain newspaper accounts which would seem to indicate that it is proposed to change the present equal allocation of funds to northern and to southern secondary roads. Nothing can be further from the facts, since neither south nor north seeks to disturb this wise provision of the Breed law. The only change suggested is a rather generous increasing of the 525 miles of southern secondary roads until they shall more nearly approach in extent the 1778 miles of secondary roads in the north.

Fortunately no one wants to precipitate a conflict between the two ends of the state. The

south is not asking for a single dollar additional for the construction or reconstruction of its secondary road system. It is asking, however, for an increased secondary mileage over which to spread the allotment which it now receives; and I have yet to meet a friend of good roads, in the Legislature or out of it, who considers this an unreasonable request. It is not right that, with practically equal traffic and almost equal area, one end of the state should continue to have nearly three and one-half times as much secondary mileage as the other: and that the latter, owing to this limited mileage, must continue to convey its equal traffic so largely over locally maintained county roads.

On one point, however, I must reiterate what I have already quoted from my biennial message, that we must see to it that no extensions whatever shall be made to the state highway system except after careful study and survey on the part of our highway engineers. To do otherwise would be to include roads which afterwards we might all regret, just as we now regret hundreds of miles which without sufficient study were long ago unwisely included in our present highway system. Having made this mistake once, we must not make it again. Even for the roads which are included we must make certain of the engineering data which shall make each of them the very best road possible for the community which it serves. The Highway Commission and Department of Public Works have indicated that they are prepared to commence this work at once, thus assuring that the necessary new secondary roads shall be promptly added. I thoroughly approve of this, and also approve of the ratio by which it is proposed to begin the correction of the very indefensible disparity of secondary mileage in the two ends of the state.

Nevertheless, while this disparity is gradually being corrected, the study as proposed must ultimately include every road in every section of the state whose probable right to a place in the state system can be demonstrated. Thus from time to time other roads will be added, both north and south, until our secondary highway systems is complete. This, when finally brought about, must be only through the admission of roads on which such adequate study has been made, and whose right to a place in the secondary highway system can not be disputed.

PROMPT INCLUSION OF NEW ROADS INSURED

It only remains to discover a method by which, when new roads are recommended to the Legislature for adoption into the system,

these roads may share in construction and maintenance funds as speedily thereafter as possible. In other words, if these roads are not formally adopted until the next legislative session, how can they be included in the highway budget made just previous to the beginning of that session?

While it might be questioned whether authority can be delegated to a highway commission actually to "adopt" new roads into the system without legislative ratification, the Highway Commission can at least, after proper study, submit these to the Legislature and include them in its proposed highway budget, thus making certain that they can be cared for as state highways two years from next July.

By this procedure no time will be lost in providing for the construction and maintenance of the new roads thus to be taken into the system. The highway budget for the present biennium is already made up, but these roads will go into the next budget, will be recommended in my next biennial message, and beyond the shadow of a doubt will be formally ratified by the next Legislature. Meanwhile, with entire justice to every section of the state, we shall have established the principle that roads shall be added to our highway system, not through political pressure, but as the result of an impartial, unbiased study of our highway needs. This will also give to the members of the Legislature supporting data for the roads in which they are interested and which they may hereafter seek to have added to the system.

BASIC PRINCIPLES FOR HIGHWAY CONSTRUCTION

I feel very strongly that the time is now ripe, and the opportunity here, to formulate a policy and establish a precedent that will govern future additions to the state highway system upon the basis of their ability to qualify as of state importance. This policy and precedent may be tersely stated as providing that expert study by state authorities must precede, rather than follow, the inclusion of roads into the state highway system.

In conclusion, permit me to call your attention to the fact that our major highway problems have been solved in a substantially satisfactory manner, with the exception of the method by which additions to the state highway system shall be made. The greatest contribution that this Legislature can make to our highway system is to formulate a policy of highway extension that will give to the system its necessary and proper measure of protection.

(Continued on page 19.)

The Designation of Sizes of Crushed Rock and Gravel

By A. R. WINSLOW, Assistant Construction Engineer.

THE method of designating sizes of crushed rock and gravel is far from satisfactory and a campaign of education at this time, with the view of later modifying the method, is desirable.

Occasionally one hears crushed rock referred to as " $2\frac{1}{2}$ " rock," " $\frac{3}{4}$ " rock," "screenings," etc. These expressions are concise but they are neither definite nor uniform for whereas " $2\frac{1}{2}$ " rock" usually means a mixture of stones of various sizes of which the stones that will just pass through a ring two and one-half inches in diameter are the largest, " $\frac{3}{4}$ " rock" usually refers to a mixture in which the stones that will pass a three-fourths-inch ring are of the medium size.

Some commercial plants have their bins numbered and the product of the plant is referred to by the number of the bin from which it is taken. Such a number system has a significance to those acquainted with the particular plant to which it applies but there is a lack of uniformity among plants both as to screen sizes and as to the manner of numbering of bins, and the number system of any one plant is not indicative of the products of others. Furthermore it does not provide for changes in screen sizes that may be made from time to time.

In specifications, the customary way of expressing the size of crushed rock or gravel is by giving the diameters of the largest and smallest stones in the mass, or rather the diameter of the holes of a screen which will just pass the largest stones and the diameter of the holes of a screen which will just retain the smallest stones. The dimensions are given in inches, halves and quarters. Dimensions expressed in this manner are somewhat cumbersome. They could be simplified by substituting decimal fractions for the common fractions.

If decimal fractions are substituted they should be carried only to the nearest tenth of an inch and the decimal point should be dropped. $2\frac{1}{2}$ " size would then become 25 size and 1" size would become 10 size. Mixed stones ranging between these sizes would be known as 10-25 stone, the smallest size always being given first. In practice the hyphen

between the 10 and the 25 would be dropped, and the stone would be referred to as 1025 stone. By this system mixed stone ranging from $\frac{1}{2}$ " to 2" would be known as 520 stone, and crusher run stone which passes a 2" screen would be known as 020 stone.

While these expressions have not quite the brevity of bin numbering, they have the advantage of fixing definitely the limits of sizes and they are sufficiently brief so that the same expressions would be used in conversation as in specifications. Note, too, the simplification of the specifications with this system as compared with present specifications. During the period of introduction a brief general clause would of course be required in specifications to define the system of measurement but from there on each reference to size would be somewhat as follows:

PROPOSED SPECIFICATIONS

"All material shall be fifteen twenty-five (1525) crushed rock."

PRESENT SPECIFICATIONS

"All material shall be crushed rock which shall pass a screen with circular opening two and one-half inches ($2\frac{1}{2}$ ") in diameter, and shall be retained on a screen with circular openings one and one-half inches ($1\frac{1}{2}$ ") in diameter."

GOVERNOR YOUNG ENUNCIATES POLICY OF STATE HIGHWAY EXTENSIONS

(Continued from page 14.)

I feel that a program outlined in a concurrent resolution, embodying by reference what I have tried to express in this message, is one in which friends of good roads all over California can join. I feel also that this is a most happy time for the formulation of these principles, since at this particular time our action will not jeopardize the interest or delay the improvement of any road in any section of the state.

Respectfully submitted.

C. C. YOUNG,
Governor.

Revised Edition of Standard Specifications

FOLLOWING previous practice of periodically issuing a new edition of the Standard Specifications for highway and bridge construction, a revised edition is now on the press and will be available for distribution in a short time.

For the convenience of contractors and engineers who are familiar with the 1927 edition, the changes which will appear in the revised edition dated January 1929 are outlined below. This summary is necessarily brief and for more complete information reference is made to the full text.

In the division devoted to general provisions, there has been added to section 1 definitions of the terms the "Director of Public Works" and "Division of Highways."

Section 4, Article (c) dealing with alterations has been expanded to fix the responsibility with the contractor for promptly filing claims for additional compensation due to change in character of work and allows ten days time for filing such claims. A new Article (d) has been added to Section 4 incorporating a latent condition clause similar to that contained in the Standard Government Form of Contract in use by the U. S. Bureau of Public Roads. Article (f) relative to construction and maintenance of detours provides that the state will bear the entire expense of constructing and maintaining detours except that detours used exclusively by the contractor for hauling shall be constructed and maintained by him; also that the state will have authority to regulate the contractor's hauling over a public detour.

In Section 5, Article (b), Plans, provides for waiver of approval of plans for cribs, cofferdams, false work, centering, etc., and places responsibility on the contractor for successful construction of the work when approval of such plans is waived. The requirement that the contractor furnish stakes necessary for staking out the work has been omitted from Article (g), Lines and Grades, and in the future stakes will be furnished by the state.

A new Article (a) has been added to Section 6 entitled "State Furnished Materials" relative to the contractor's responsibility for the care and unloading of materials furnished by the state. This article is identical with the

section now appearing in the Special Provisions covering the same matter and will be omitted from them in the future. The Special Provisions will contain only a statement of the materials to be furnished by the state and the points of delivery.

The graded deval abrasion test has been eliminated from Article (d), Special Methods of Tests, as that test has been abandoned in determining the acceptability of road material.

Section 7 (e), Public Convenience and Safety, has been rewritten to provide that in so far as practicable the state will assume all costs of maintaining traffic. It provides that the state will defray the expense of flagmen and guards required to direct and control traffic and such special signs as may be required; however, any flagmen or guards stationed to protect the work or to watch working equipment shall be paid for by the contractor.

A new paragraph has been added to Section 8 (e) incorporating an "Act of God" clause, relieving the contractor from responsibility for delay in completing the work due to certain causes enumerated in the specifications beyond his control.

The amount retained on progress estimates has been reduced to 10%.

In the division relating to construction details a new article (e) has been added to Section 11, Earthwork, to provide that the state will pay for grading construction roads to permit access to the lower portions of high fills in order that they may be compacted. The payment clause provides that grading work will be measured in excavation and the clause providing for payment in embankment has been eliminated. The payment clause for structure excavation has been rewritten to clarify the intent in regard to payment for backfill. Payment for backfill at culverts, retaining walls, and other structures except bridges is made at the contract price for structure excavation; that is, the quantity of structure excavation to be paid for is the quantity excavated plus the quantity back-filled. In the case of bridges over 20' clear span no allowance is made for backfill and the contractor must absorb the cost of backfill in the price paid for the excavation.

The article on embankment has been expanded to provide that adobe material shall

be placed in the bottom of fills and that embankments shall be constructed in 8" layers and thoroughly compacted by rolling and watering. Cases where embankments are constructed from rock excavation and of sand are also covered. A clause has also been added that no rocks larger than 6" in size may be placed in the upper 2' of embankments. The articles on borrow excavation have been rewritten to provide that payment for imported borrow shall also include the necessary haul and that no allowance will be made for haul of imported borrow. The article on overhaul has been revised to provide for the contractor submitting a bid for overhaul as has been our practice for some time.

Section 12 on subgrade has been rewritten; however, the requirements of the specifications have not been changed except that subgrade for macadam surfacing shall be prepared as specified for asphalt and concrete pavement.

A paragraph has been added to Section 13, on shoulders, requiring that they be rolled when adjacent to pavement.

A new section numbered 14 has been added for finishing roadway. This section is the same as the one included in the Special Provisions for work now advertised and provides for including an additional item in the bid scheduled.

Section 16, Untreated Crushed Gravel or Stone Surfacing, provides that all material shall be crushed and if gravel is used that portion passing a screen with openings $\frac{1}{4}$ " greater than the maximum crusher opening during normal crusher operation shall be wasted and not used in the work. The payment clause has been amended to omit the provision that additional binder would be paid for as extra work and requires the contractor to furnish binder without additional pay.

A new Section 17 has been added for oil treated crushed gravel or stone surfacing.

The section formerly entitled "Waterbound Macadam Base Type B" has been entitled "Crusher Run Base" in the new edition; otherwise, the specifications remain identical with the former.

The section on side forms provides that all forms shall be cleaned and restored to their original condition before being used a second time. It requires the use of side forms for macadam and provides that for macadam and asphalt concrete paving work the timber side forms be left in place.

New paragraphs have been added to the section on Waterbound Macadam Base requiring the use of side forms which shall be left in place after the surfacing is completed, also

providing for testing and truing up the surface before rolling the broken stone.

The section on bituminous macadam surface includes an additional size rock from $\frac{3}{4}$ " to $\frac{1}{2}$ " designated key rock for filling after the first application of bituminous binder; screenings from $\frac{1}{2}$ " to $\frac{1}{4}$ " are to be used for filling after the second application of bituminous binder. A new paragraph has been added to provide for testing and truing up the broken stone to insure a smooth riding surface.

The asphalt concrete specifications permit the use of coarse aggregate containing up to 15% of particles which show a loss in the Los Angeles Rattler in excess of 55%. They provide that no mixture shall be spread when the atmospheric temperature is below 40° F., nor during rainy weather. The use of automatic spreading and finishing machine is required as has been specified during the past year. The laying of the base course is limited to a distance of not more than one mile before it is covered with the surface course. A provision has been included requiring one ten-ton macadam roller and sufficient eight-ton tandem rollers to provide one roller for each 1200 square yards of pavement laid per day, and that rolling shall continue until the pavement has a relative specific gravity of not less than 92% of the specific gravity of the combined aggregates. A new section has been added entitled "Asphalt Concrete Leveling Course" using material graded from 1-14" down. This mixture is to be used as the lower course on resurfacing work where thin layers are required, and provides a mixture with more large aggregate, less fine aggregate and less asphalt content than the Type "A" surface mixture. The sections for asphalt concrete surface, Type "D," and asphaltic surface, Type "E" (Mastic) have been omitted.

The section on Portland Cement Concrete pavement has undergone some rearrangement of text in the first few articles. Pavement is specified to be laid in strips 10' wide without additional payment for such part width construction; this requirement eliminates the longitudinal weakened plane joint. A new specification for expansion joint filler has been included, together with the requirement that backing plates be used in the installation of expansion joints. This provision is similar to the specifications included on recent concrete pavement work. The material specifications for the joint filler has been made a separate section—No. 63. An impervious membrane method of curing has been included to permit the use of the Hunt process for curing bridge decks and where it may be specifically permitted.

Highway Patrolmen Commend Striping In State Roads

The California Association of Highway Patrolmen adopted the following resolution at a meeting held in San Jose on March 30th:

Whereas, The California Association of Highway Patrolmen is an organization composed of traffic enforcement officers especially detailed on the public highways of this state to guard said highways against traffic offenders who endanger the life and property of law-abiding citizens, and

Whereas, This Association unites with any agency that initiates movements or adopts policies that will promote the safety of the motorists on the public highways against the danger of automobile accidents and thus prevent the loss of life and property, and

Whereas, The Board of Public Works of the State of California has seen fit to paint lines on dangerous curves and over hills on various state highways under its supervision, and

Whereas, It is known to the members of the California Association of Highway Patrolmen that the presence of said lines on the highways assists and guides the automobile drivers traversing said highways and thus prevents or tends to reduce the number of automobile accidents, now, therefore, be it

Resolved, That we, the members of the California Association of Highway Patrolmen, do hereby highly commend the Board of Public Works of the State of California for its good work in helping to minimize the number of accidents on our highways, and we sincerely hope that its efforts will continue unabated.

CALIFORNIA ASSOCIATION OF HIGHWAY PATROLMEN,

FRANK J. DUNCAN, President,

By John Sansone, Secretary.

THE MEN WHO MAKE THE ROADS

O, Brothers, when you motor out
In double fours of flivvers,
To lamp the landscape round about
And agitate your livers,
The while your gas-consumer flies,
O'er beaten trails and byways;
Oh, breathe a prayer and bless the guys
That built the bloomin' highways.

Be mindful of their lowly lot,
They rarely ride as you do.
You drive nice cars, but they do not—
At least a very few do.
And life would be a dreary hike
If it were not for fellows like
The ginks that give us highways.

—C. Wiles Hallock, in
Western Highways Builder.

As part of the matriculation examination in English, the entering students were asked to write a brief definition of their conception of a self-made man. One young lady wrote as follows:

"A self-made man is like a self-made cigarette—a lot of Bull wrapped in a transparent cover."

ALONG THE FEATHER



The above concrete culvert was built by men in a prison camp near Oroville, now engaged in building the Feather River lateral to the state highway system.

PROTECTING AGAINST FIRE

The maintenance department organization has been busily engaged in getting the roads in as good shape as possible for the increase in travel which is coming with good weather. Several outfits are engaged in spraying Diesel oil along the roadsides and will have several hundred miles of roadside protected from fire hazard by this means within the next two or three weeks.

A pupil was having trouble with punctuation and was being called down by the teacher.

"Never mind, sonny," said the visiting school board president, consolingly, "it's foolish to bother about commas. They don't amount to much, anyway."

"Don't they?" replied the teacher, turning to the president. Then calling to one of the pupils she ordered the boy to write on the board this sentence: "The president of the board says the teacher is a fool."

"Now," she continued, "put a comma after 'board' and another after 'teacher'."

REVISED EDITION OF STANDARD SPECIFICATIONS

(Continued from page 21)

The section on concrete structures has been materially revised. The articles on cofferdams and caissons, forms and false work, concrete deposited under water, construction methods, bonding, curing, and the various surface finishes have been completely rewritten. A paragraph has been added permitting the use of diatomaceous earth up to three pounds per sack of cement in structure concrete.

The section on timber structures has been completely rewritten and specifications included for Douglas fir, southern yellow pine, redwood, cedar and yellow pine.

The specifications for concrete permit the use of aggregate containing up to 15% of particles which show a loss in the Los Angeles rattler in excess of 55%. A paragraph has been added providing that the contractor shall defray the cost of sampling and testing cement sampled directly from the car when he neglects to arrange with the cement company to select aside sealed bins or rooms from which samples may be taken by the state.

The specifications for mesh reinforcement for use in reinforcing second story pavement over the edges of the old base have been amended to omit the requirement that the cross-sectional area of the longitudinal members equals 70% of the cross-sectional area of the corresponding methods of bar reinforcing.

The section on rubble masonry has been rewritten to be more complete than the former section.

The section on reinforced concrete pipe culverts has been rewritten to conform with the tentative Standard Specifications adopted by the Joint Concrete Culvert Pipe Committee.

A specification for plain concrete pipe has been added to the section on vitrified clay pipe and a strength requirement has been included.

The section on timber piles and preservative treatment of timber and piles has been completely rewritten.

The section on underdrains includes cement concrete tile and provides that perforated metal pipe shall be manufactured of metal conforming to the requirements of the first alternative for corrugated metal culverts.

The section on guard rail provides for concrete posts as well as timber posts and omits the requirement that timber posts be dipped.

In the section on paint and painting, the specifications for turpentine have been revised

to include gum turpentine, wood turpentine, and turpentine substitute. The article on drier contains specifications for both a straight oil drier and Japan drier. A new article has been added containing a formula for guard rail paint.

The specifications for asphaltic road oil calls for an asphalt content of 94% plus. The specifications for fuel oil provide for two grades, light fuel oil to contain from 50% to 60% asphalt, and heavy fuel oil to contain from 60% to 70% asphalt.

GRADE CROSSING ACCIDENTS SHOW DECREASE IN 1928

(Continued from page 14.)

ber of serious accidents, and June the least. Saturday has more accidents of any day of the week, and Sunday the least. The greatest number of accidents occur between five and six p.m. and the least number between four and five a.m., during the 24 hours.

Some interesting facts have been developed by the Transportation Division of the Railroad Commission in its tabulation and study of grade crossing and other accidents involving common carriers in California in 1928, made by Joseph G. Hunter, Chief of Division.

The railroads have expended \$3,000,000 under the direction of the Railroad Commission in crossing protection devices, the maintenance of which costs approximately \$800,000 per year. Notwithstanding this expenditure of money, accidents occur at many grade crossings, protected with the most improved automatic signal devices. Of the 2179 grade crossing accidents in 1928 there were 917 at crossings protected only by signs of different types, while 538 occurred at crossings protected by automatic wig-wags.

"Trying to beat the train" across the grade crossing, accounted for a large proportion of these accidents. Driving past other automobiles standing at the crossings, and being struck by a train or electric interurban car, accounted for 10 persons killed, and 38 persons injured.

The report calls attention to a growing tendency of drivers to be impatient at grade crossings, and to hasten upon the crossing with disastrous results. Adoption of the recommendations of the "Hoover Committee," making it a misdemeanor to drive over a grade crossing when the warning signal is in motion, and granting authority to the State Highway Commission to designate crossings where all vehicles must stop, is favored by the Commission's transportation Engineers.

Liza and Fannie were discussing their Sunday night dates.

"Yes, mum. I done had me a neckin' party last night."

"Neckin' party? Law, chile, them is out of style. They done had them 4000 years ago."

"Four thousand year ago?"

"Sure, my mammy done told me the Bible says that King Solomon took the Queen of Sheba into the banquet hall and he fed her wine and nectar."

So live that you wouldn't be afraid to sell the family parrot to the town gossip.—*Troy Times*.

SEMI-ANNUAL TRAFFIC COUNT

(Continued from page 6.)

Route No.	Sunday		Monday	
	Gain	Loss	Gain	Loss
	Pct.	Pct.	Pct.	Pct.
51. Santa Rosa to Schellville-----	--	11	1	--
52. Alto to Tiburon-----	--	18	2	--
53. Fairfield to Lodi-----	--	4	9	--
55. San Francisco to Spring Valley Dam-----	--	27	--	38
57. Santa Maria to Bodfish via Bakersfield-----	--	37	7	--
58. Mojave to Topoc-----	46	--	45	--
60. El Rio to San Juan Capistrano--	30	--	4	--
64. Mecca to Blythe-----	--	21	20	--
65. Auburn to Sonora-----	--	5	23	--
68. San Francisco to Burlingame--	--	31	--	31
71. Crescent City to Oregon Line--	30	--	30	--
Average of all routes-----	8	--	4	--

The count by stations follows:

Route 1. San Francisco to Oregon Line

Station	January, 1928		January, 1929	
	Sun.	Mon.	Sun.	Mon.
	15	16	13	14
San Rafael, north of city at top of hill-----	4,299	1,609	4,019	1,853
Petaluma, north of city-----	4,945	3,871	*	*
Santa Rosa, south of city, Triangle service station-----	2,798	1,821	*	*
*Road closed.				
Santa Rosa, north of city at railroad crossing-----	3,079	2,474	3,414	2,854
Healdsburg, south of city at railroad crossing-----	1,797	1,331	1,561	1,394
Ukiah, south of city, junction Rt. 70-----	797	980	1,306	1,013
Ukiah, north of city, junction route 15 to Colusa-----	885	616	1,082	796
Willits, north of city, junction road to Fort Bragg-----	370	268	509	379
Eureka, south of city limits-----	2,753	1,813	3,279	2,321
Arcata, north of city at junction route 20-----	1,222	893	456	296
Crescent City, junction of road-----	460	434	536	491
At Oregon Line-----	70	63	126	104

Route 2. San Francisco to San Diego

Station	January, 1928		January, 1929	
	Sun.	Mon.	Sun.	Mon.
	15	16	13	14
Colma, junction road to South San Francisco-----	18,497	8,767	13,850	7,570
San Bruno Junction Bay Shore Road-----	20,561	8,444	17,423	8,174
San Mateo, south of city at 16th Ave.-----	19,231	9,461	18,956	8,996
Redwood City, north of city limits-----	16,122	8,513	17,309	8,072
Palo Alto, at road to Federal Tel. Sta.-----	11,521	5,834	11,667	5,692
San Jose, north of city at Lumber yard-----	16,289	17,159	17,069	17,830
San Jose, south of city limits-----	6,098	5,464	6,367	5,004
Gilroy, north of city, junction road to Watsonville-----	4,861	3,353	4,927	3,963
Salinas, south of city limits-----	1,995	1,701	2,388	2,301
Paso Robles, north of city limits-----	1,028	880	1,154	954
Paso Robles, south of city limits-----	1,631	1,229	1,759	1,282
San Luis Obispo, north of city limits-----	1,777	1,268	2,001	1,418
San Luis Obispo, south of city limits at railroad crossing-----	2,791	1,910	3,345	2,200
Santa Maria, north of city junction Route 57 to Bakersfield-----	1,671	1,178	2,182	1,229
Santa Barbara, west of city, junction San Marcos road-----	2,865	1,864	4,609	2,826
Santa Barbara, 300 feet east of city limits-----	5,836	4,928	8,786	7,828
Ventura, west of city at bridge-----	6,106	4,466	6,221	2,990
Ventura, west of city limits-----	5,208	3,710	6,653	4,316
Los Angeles, east of Indiana St.-----	21,462	19,330	25,438	21,322
Whittier, at junction with Hadley St.-----	13,001	9,667	20,592	12,719
Anaheim, north of city limits-----	11,315	8,362	12,744	8,054
Santa Ana, north of city at junction county road to Orange-----	8,976	6,659	10,746	6,628
Serra, junction route 60-----	3,392	1,955	5,718	2,467
Oceanside, near south city limits-----	4,701	3,147	6,768	3,729
Delmar, at Santa Fe Railroad crossing-----	4,086	2,409	5,923	2,672

Route 3. Sacramento to Oregon Line, via Marysville

Station	January, 1928		January, 1929	
	Sun.	Mon.	Sun.	Mon.
	15	16	13	14
Sacramento, north at junction with Garden Highway-----	9,095	9,689	8,992	9,329
Marysville, south of city at junction Hammonton road-----	1,550	1,360	1,867	1,675

Station	January, 1928		January, 1929	
	Sun.	Mon.	Sun.	Mon.
	15	16	13	14
Yuba City, north of city at junction Route 15-----	2,105	2,231	2,117	2,205
Chico, at junction county road to De Saba-----	2,431	2,039	2,168	1,767
Chico, north of city, junction county road east-----	1,650	1,267	1,149	1,131
Red Bluff, at junction route 29 to Susanville-----	894	909	932	791
Redding, south of city, junction route 28 to Alturas-----	1,213	1,280	1,012	980
Dunsmuir, north of city limits at bridge-----	1,258	1,207	1,659	1,192
Yreka, south city limits-----	985	869	1,153	1,015
At Oregon Line-----	462	356	524	366

Route 4. Sacramento to Los Angeles (Valley Route)

Station	January, 1928		January, 1929	
	Sun.	Mon.	Sun.	Mon.
	15	16	13	14
Sacramento, south of city limits-----	6,164	5,725	5,167	4,698
Lodi, junction route 24 to San Andreas-----	2,724	2,058	2,615	2,141
Stockton, north of city at Cherokee Station-----	5,097	4,007	1,595	1,360
Modesto, north of city-----	5,130	4,212	4,869	4,297
Modesto, south of city-----	5,208	4,974	5,241	5,043
Turlock, north of city-----	3,336	2,580	3,238	2,798
Turlock, south of city-----	2,523	1,991	3,042	2,460
Atwater, north of city-----	2,342	1,827	2,401	2,078
Merced, north of city at bridge-----	3,388	3,073	3,426	3,282
Merced, south of city at bridge-----	2,382	2,196	3,426	3,282
Fresno, south at maintenance yard Kingsburg, south of city near Kings River Bridge-----	7,036	6,752	7,084	7,149
Tulare, south city limits-----	2,172	1,665	2,171	1,711
Bakersfield, north of city, junction county road to Oil Center-----	2,350	2,078	2,334	2,123
Castaic, junction county road to Santa Paula-----	5,297	4,923	3,811	3,088
Saukus, junction route 32 to Mojave-----	3,277	1,863	3,675	2,251
Newhall, end of section L.A.-4-E-----	6,746	2,644	9,294	5,266
	9,730	3,494	11,650	4,336

Route 5. Stockton to Santa Cruz via Oakland

Station	January, 1928		January, 1929	
	Sun.	Mon.	Sun.	Mon.
	15	16	13	14
Tracy, west of city, junction county road to Byron-----	2,702	1,491	3,750	1,896
Livermore, east of city, junction county road to Livermore-----	1,786	1,123	3,633	1,948
Hayward, junction with Castro Valley road-----	1,418	1,104	6,052	2,385
Niles, junction Niles Canyon road-----	4,457	2,317	3,387	2,166
Nine miles north of San Jose, junction county road to Centerville-----	6,509	2,351	5,147	1,982
Five miles north of San Jose-----	8,330	3,662	7,889	3,319
San Jose, at north city limits-----	5,697	3,437	5,734	2,847
San Jose, west of city at sanitarium-----	6,722	6,180	7,054	6,421
Los Gatos, northeast of city-----	3,267	1,929	2,863	1,698
Santa Cruz, north of city-----	2,168	897	2,217	1,049

Route 6. Sacramento to Woodland Junction

Station	January, 1928		January, 1929	
	Sun.	Mon.	Sun.	Mon.
	15	16	13	14
West of Sacramento at underpass-----	4,114	3,008	3,561	2,773
Davis, east of city, at underpass-----	3,383	2,563	2,821	2,218

Route 7. Tehama Junction to Benicia

Station	January, 1928		January, 1929	
	Sun.	Mon.	Sun.	Mon.
	15	16	13	14
Benicia, north of city-----	681	258	477	254
Fairfield, east of city-----	2,778	1,804	2,548	1,844
Dixon, south of city-----	2,354	1,484	2,228	1,576
Woodland, south of city-----	2,237	1,711	1,875	1,563
Williams, south of city-----	1,051	769	1,124	802
Willows, south of city-----	1,055	950	1,387	1,444
Orland, at junction route 47 to Chico-----	892	865	1,121	934
Red Bluff, south of city at Reed Creek bridge-----	795	964	984	990

Route 8. Ignacio to Cordelia via Napa

Station	January, 1928		January, 1929	
	Sun.	Mon.	Sun.	Mon.
	15	16	13	14
Petaluma Creek bridge-----	1,113	290	1,036	3 42
Schellville, junction route 51 to Santa Rosa-----	878	756	813	423
Napa, junction county road to Vallejo-----	3,675	1,608	3,088	1,681
Cordelia, junction route 7-----	2,742	1,433	2,332	1,510

Route 9. San Fernando to San Bernardino

Station	January, 1928		January, 1929	
	Sun.	Mon.	Sun.	Mon.
	15	16	13	14
Tujunga, west of Sunset Blvd.-----	3,290	1,290	7,059	2,734
La Crescenta, west of Pennsylvania Ave.-----	6,354	2,945	7,326	3,275
Pasadena, east of city limits-----	11,174	6,714	15,108	6,961
Azusa, west of city limits-----	11,507	4,603	13,372	5,728
Upland, east of city at junction county road to Upland-----	4,331	1,717	5,376	2,092
San Bernardino, west of city-----	5,908	3,369	6,886	4,047

Route 10. San Lucas to Sequoia National Park

Station	January, 1928		January, 1929	
	Sun. 15	Mon. 16	Sun. 13	Mon. 14
San Lucas, south of city at junction route 2-----	43	70	106	115
Coalinga, west of city-----	372	234	309	227
Hanford, west of city limits-----	1,379	1,432	1,688	1,688
Hanford, east of city, intersection county road to Kingsburg and south to Corcoran-----	2,182	2,087	1,843	1,908
Visalia, east of city of Exeter junction-----	1,363	870	1,289	1,209

Route 11. Sacramento to Nevada Line via Placerville

Sacramento, east of city limits-----	3,304	2,223	2,811	1,667
Folsom, west of city at junction with Pratt's road-----	1,187	723	1,071	684
Placerville, west of city-----	1,318	536	1,042	483
Placerville, east of city-----	1,177	591	1,110	553
Between Riverton and Kyburz-----	112	22	No count	

Route 12. San Diego to El Centro

San Diego, east of city, Euclid Ave. at Cajon Ave.-----	2,519	2,370	8,872	4,054
El Cajon, west of city limits-----	5,249	3,330	6,541	2,558
Jacumba, at junction county road to El Campo-----	652	385	815	602
El Centro, west of city at junction route 26 to San Bernardino-----	1,744	1,774	2,401	2,229

Route 13. Salida to Sonora

East of Salida, at McHenry's Ave. to Modesto-----	1,229	827	960	773
Oakdale, west of city-----	1,417	909	1,235	908
Sonora, south of city-----	1,938	1,231	2,272	1,413
Sonora, east of city-----	1,475	660	1,517	483

Route 14. Albany to Martinez

Albany, at county line-----	17,748	11,402	16,783	11,917
Junction county road to Richmond-----	14,008	8,000	12,769	8,547
Junction Franklin Canyon road-----	5,607	2,763	5,235	2,351
Carquinez Bridge-----	3,434	1,537	3,377	1,753
Crockett, 1 mile south of city, junction county road to Crockett-----	1,606	1,182	990	1,029
Martinez, west of city limits-----	974	408	510	461

Route 15. From Route 1 Near Calpella to Grass Valley

Ukiah, north at junction route 1-----	416	319	518	378
Near Venada, junction county road to Bartlett Springs-----	34	103	26	42
Williams, west of city-----	293	444	561	487
Williams, east of city-----	554	553	545	469
Colusa, east of city-----	788	778	566	507
Marysville, east of city-----	522	432	416	403
Grass Valley, west of city-----	311	196	961	406

Route 16. Hopland to Lakeport

Hopland, at junction route 1-----	371	337	494	476
Lakeport, south of town-----	663	541	561	544

Route 17. Roseville to Nevada City

Roseville, east of city-----	2,042	1,312	2,493	1,335
Auburn, south of city at S. P. R. R. crossing-----	1,725	1,309	1,330	710
Auburn, north of city at junction Country Club road-----	897	508	568	255
Grass Valley, south of city-----	771	421	1,011	455
Nevada City, south of city-----	1,074	843	1,221	905

Route 18. Merced to El Portal

Merced, at intersection county road and 21st street-----	1,485	1,193	1,854	1,200
Merced, 12 miles east at junction county road to Le Grand-----	862	192	1,087	236
Mormon Bar, at junction county road to Mormon Bar-----	996	322	1,282	334
Riceburg, Bear Creek bridge-----	869	263	899	126

Route 19. From Route 9 West of Claremont to Riverside

Between Pomona and Ontario, at Chino cross roads-----	12,023	6,551	13,034	5,311
Los Angeles County line, east limits of Pomona-----	12,337	6,510	13,209	6,783
Riverside, west of city near Santa Ana River Bridge-----	7,373	5,226	7,866	4,754

Route 20. Route 1 Near Arcata to Redding

Station	January, 1928		January, 1929	
	Sun. 15	Mon. 16	Sun. 13	Mon. 14
Arcata, north of city at junction Rt. 1-----	848	423	811	560
Weaverville, 3 miles south-----	38	40	96	77
Between Redding and Tower House-----	136	176	175	166

Route 21. Route 3 Near Richvale to Quincy

Oroville, east of city-----	576	457	833	752
Quincy-----	54	51	116	49

Route 22. San Juan Bautista to Route 32 via Hollister

San Juan Bautista, south of city at junction route 2-----	1,470	907	1,639	918
Hollister, junction route 32-----	708	303	518	249

Route 23. Saugus to Bishop

Saugus, junction with route 4-----	5,157	1,513	7,645	2,490
Lancaster, junction with route 59 to Neenach-----	1,464	899	1,841	1,015
Freeman, 1 mile north, junction to route 57-----	130	93	165	105
Lone Pine-----	489	534	338	364
Bishop, half mile north junction county road north and county road easterly-----	302	321	488	406

Route 24. Route 4 Near Lodi to Valley Springs

Lodi, junction route 4-----	1,363	1,103	1,262	1,085
Between San Andreas and Valley Springs-----	1,925	248	1,223	241

Route 25. Nevada City to Downieville

Nevada City, north of city-----	162	148	276	184
Camptonville, north of city-----	54	73	107	101

Route 26. San Bernardino to El Centro

San Bernardino, south of city at north end of Santa Ana Bridge county road to Colton-----	3,066	2,503	4,864	3,150
At intersection Mt. View Ave., west of Redlands-----	2,988	1,946	5,571	3,399
Beaumont, junction Jack Rabbit Trail-----	1,771	1,173	3,657	1,715
Coachella, south of city at junction county road to Thermal and Mecca-----	1,434	915	1,449	1,056
Westmorland at railroad crossing-----	2,023	1,715	2,620	2,371
Brawley Junction, southwest of city-----	2,843	2,641	3,340	2,903
El Centro, west of city, junction Route 12-----	4,306	3,985	5,034	4,481

Route 27. El Centro to Yuma

El Centro, east of city at junction county road north to Brawley and south to Calexico-----	2,484	3,131	2,940	3,003
East of Holtville-----	1,572	1,585	1,728	1,621
Sand Hills maintenance station-----	792	518	928	580
Yuma at S. D. A. plant quarantine station-----	2,658	2,031	2,853	1,954

Route 28. Redding to Nevada Line via Alturas

Redding, south of city at junction with route 3-----	445	479	468	488
Four miles east of Pittville at maintenance station-----	103	87	120	54
Canby-----	65	76	173	159
Five miles north of Alturas at junction road to Lakeview-----	43	39	104	84

Route 29. Red Bluff to Nevada Line via Susanville

Red Bluff, east at junction route 3-----	261	269	261	200
Susanville, 1 mile west of town-----	314	186	670	286
Susanville, 1 mile east of town-----	743	503	1,108	747
Five miles south of Constantia-----	53	50	128	88

Route 31. San Bernardino to Jean

San Bernardino, north of city at junction Mt. Vernon and Highland Aves.-----	3,669	1,031	3,680	1,059
South of town limits of Victorville-----	1,084	635	1,472	856
Southwest town limits of Barstow-----	457	350	704	483
Nevada state line-----	96	94	200	169

Route 32. Route 2 Near Gilroy to Route 4 Near Califa

Station	January, 1928		January, 1929	
	Sun. 15	Mon. 16	Sun. 13	Mon. 14
Hollister, junction with route 22	802	374	878	416
Pacheco Pass at Merced-Santa Clara County Line	973	371	1,025	428
East of Los Banos at junction county road to Dos Palos	447	376	1,125	820
Califa	1,068	439	514	344

Route 33. Paso Robles to Route 4 Near Bakersfield

Paso Robles, east of city	1,005	914	1,147	928
Paso Robles, one-quarter mile east of city	618	488	617	501
Lost Hills, intersection of Main street	218	233	355	372

Route 34. From Route 4 Near Arno to Pine Grove

Twin Cities, junction route 4	304	282	254	186
West of Lone, junction county road to Michigan Bar	188	119	162	143
North of Jackson, junction route 65 to Placerville	634	461	617	471
Pine Grove, east of town	239	120	289	149

Route 37. Auburn to Nevada Line Near Verdi

Auburn, east of city	1,370	1,155	1,368	647
Colfax, east of city, junction Nevada City road	392	200	703	132
Truckee, east of city, junction route 38 to Nevada	119	48	340	104

Route 43. San Bernardino to Big Bear Lake

Foot of Waterman grade	966	350	1,401	222
Pinecrest, junction county road to Arrowhead Lake	175	30	497	50
Running Springs Park, junction City Creek road	57	No count	299	37
West end of bridge over Big Bear dam	58	18	268	57
One mile from end of route 43, junction county road to Pine Knot	89	30	109	36

Route 44. Boulder Creek to Redwood Park

Boulder Creek at park line	373	239	493	315
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Route 47. Orland to Chico

Orland, junction with route 7	565	490	738	819
Chico, west of city	1,077	834	906	929
Hamilton City, at Union High School	376	179	No count	

Route 48. McDonalds to Wendling

McDonald, junction route 1	113	104	148	112
Wendling, 3 miles west of town	233	158	288	177

Route 49. Calistoga to Lower Lake

North of Calistoga at foot of grade	363	237	321	239
Lower Lake, junction Kelseyville and L. L. road	321	345	200	234
Middletown, junction Cobb Min. road	493	408	640	519

Route 51. Santa Rosa to Schellville

Santa Rosa, east of city	2,461	1,762	2,044	1,768
Schellville, junction route 8	712	342	766	360

Route 52. Alto to Tiburon

Belvedere, junction	1,439	862	1,186	883
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Route 53. Fairfield to Lodi

Denverton, at overhead crossing	345	152	109	199
Rio Vista bridge	996	895	888	809
Walnut Creek bridge	246	252	630	557
Thornton, intersection county road	755	558	604	477
Lodi, north of city	931	860	727	927

Route 55. San Francisco to Spring Valley Dam

At swimming pool	10,101	1,866	7,925	1,274
Junction with county road to Colma	7,182	977	4,936	476
Junction with county road to Belmont at earth dam	3,740	427	2,551	270

Route 57. Santa Maria to Freeman via Bakersfield

Station	January, 1928		January, 1929	
	Sun. 15	Mon. 16	Sun. 13	Mon. 14
Santa Maria, north of city at junction route 2	108	61	165	65
At San Luis Obispo-Kern County line	106	284	122	67
Maricopa, west of city	423	247	323	296
Bakersfield, 1 mile east of city limits	2,827	1,931	1,733	2,235
Bakersfield, 10 miles east at Country Club road	1,040	130	407	171
Bodfish, at intersection route 57 with county road to Caliente	77	75	116	76

Route 58. Mojave to Topoc

Barstow, north of city at junction county road	207	209	250	248
Daggett, junction Arrowhead trail	285	267	435	365
Vicinity Amboy	128	148	141	183
Needles, west of city limits	416	206	681	411

Route 60. El Rio to San Juan Capistrano

Santa Monica, 500 feet west of Santa Monica Canyon	10,035	2,940	11,548	2,588
Lomita	6,997	5,717	9,869	6,318
Seal Beach, at Los Angeles-Orange County Line	10,182	5,714	13,880	6,092

Route 63. Big Pine to Oasis

Big Pine, junction route 23			102	131
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Route 64. Mecca to Blythe

Desert Center	97	85	88	97
Blythe, S. D. A. quarantine station	336	150	255	184

Route 65. Auburn to Sonora (Mother Lode Highway)

Auburn to wire bridge	156	88	168	68
Placerville, northwest of city, junction Georgetown road	97	78	323	246
El Dorado, south of city	203	106	220	128
Central House	357	258	386	328
North of Jackson, junction route 34	748	630	605	683
South of San Andreas, at Sheep Camp	1,962	418	1,439	446
West of Sonora, junction county road south to Jamestown	219	135	406	206

Route 66. Manteca to Route 5 Near Mossdale School

Mossdale, junction route 5	1,728	988	1,949	1,121
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Route 68. San Francisco to Burlingame

San Bruno, junction with route 2 to San Francisco	5,866	3,372	1,726	1,424
North city limits of South San Francisco	6,292	4,603	6,703	4,062

Route 71. Crescent City to Oregon Line

Crescent City north of maintenance yard	526	480	654	579
At Oregon-California line	179	71	263	136

THE NEXT BUDGET

The district engineers have been requested to submit a schedule of dates for advertising the projects included in the budget for the next biennium. These schedules are now being reviewed for the purpose of adopting a program of advertising, which will place the projects under construction at the time of year when weather conditions are most favorable and also when there will be the least interference with traffic.

A man who was wanted by the police had been photographed in six positions, and the picture sent in to the state police. In a few days headquarters received this from a small-town chief: "I duly received the pictures of the six miscreants wanted. Five of them have been captured and we are on the trail of the sixth."—*Earth Mover*.

Progress Reports From the Counties

BUTTE COUNTY

The graveling of the surface between Butte Creek and Biggs Road on the Willows-Biggs Highway, recently completed by contract, is being further improved with additional surfacing of crushed rock. This work is preparatory to oil treating the surface to be done during the biennium beginning July of this year.

DEL NORTE COUNTY

Parker Schram Company, who have the contract for constructing the bridge over Smith River, approximately nine miles west of Crescent City on the Crescent City-Grants Pass Highway, are making good progress with the erection of the steel. About three-fourths of the steel work is now erected and it is expected that the bridge will be opened to traffic about the middle of May.

The two J. E. Johnston contracts on either side of the Klamath River in Del Norte County, have been practically shut down during the winter except for the crushing and stock piling of surfacing material. It is expected that the work will again be started about the middle of April or the first of May.

EL DORADO COUNTY

Plans and estimate are ready for a grading project between Bay View Rest and one mile north of Eagle Falls, on a portion of the Truckee-Meyers National Forest Highway.

The work will consist of improving and revising the grade and alignment and widening the present 12- to 16-foot road to a 24-foot roadbed.

The road traverses the rugged slopes overlooking Emerald Bay of Lake Tahoe, and the quantities of construction are extremely heavy.

Traffic will be carried through construction at all times and the only inconvenience to the public will be the slowing of travel between the limits of the work.

FRESNO COUNTY

The new bridge over the San Joaquin River at Herndon is being painted and surfaced and construction of approaches is well under way.

Surfacing from Coalinga westerly on Route 10 has been started by a state crew under Foreman Gaston.

Grading work on the approaches to the new San Joaquin River bridge at Herndon has been completed and it is expected that paving will start at once.

Bids for surfacing, with oil-mix the seven miles west of Coalinga, on the Sierra-to-the-sea lateral, will be received April 10th. State forces are surfacing the county-built portion of this road to the Monterey County line under Foreman J. H. Williams.

GLENN COUNTY

The five miles of roadway grading between Logandale and Willows, and which D. McDonald is under contract to build, is expected to be completed in April.

The grading, which is entirely to the west of the present pavement, is being done to permit of an ultimate 40-foot pavement on this route. No inconvenience has been experienced by traffic while the

grading has been under way, as the existing pavement has been left clear and open at all times to the public.

A gravel subbase, preparatory to the construction of a concrete pavement, is planned to be laid about the middle of this year.

A contract let in December, 1928, to E. B. Skeels for the building of a three-span reinforced concrete bridge across Quint Canal, about four miles east of Willows, on the Willows-Butte City Highway, is completed and was opened to traffic on March 18.

HUMBOLDT COUNTY

Bids for the grading of the site for the District I office and shop buildings at Eureka, were opened February 14, and the contract has been awarded to Henry Padgett of Fields Landing. The contractor started work the first of March.

Bids were received March 13th for the construction of the new bridge over Mad River, approximately four miles north of Arcata. The new bridge is to consist of two 150-foot steel through truss spans and 400 feet of trestle approach.

KERN COUNTY

Grading work is in progress on C. W. Hartman's contract from Maricopa easterly on Route 57.

Force, Currgan & McLeod are making good progress on their contract for grading and surfacing from Bakersfield to the mouth of the Kern River Canyon on Route 57.

Paving work is well under way from Wasco to Famosa on the Cholame Lateral by the Valley Paving & Construction Company.

The Valley Paving Company has completed half of their contract for paving from Wasco to Famosa on the Cholame Lateral.

Force, Currgan & McLeod are making rapid progress on their contract for grading and oil-mixed surfacing from Bakersfield to the mouth of the Kern River Canyon on Route 57.

Culverts and grading work are well under way on C. W. Hartman's contract for grading and surfacing 12 miles on Route 57 between Maricopa and Bakersfield.

LAKE COUNTY

The grading of a 24-foot highway between Clear Lake Oaks and Abbott Mine, which is being built by convict labor forces, is progressing satisfactorily, and will be completed about June.

Construction of 10.6 miles of grading and surfacing with oil treated crushed stone between Lucerne and Clear Lake Oaks, by Von der Hellen, Pierson & Logan, the contractors, is progressing according to schedule.

The expected date for completion of the work is October.

MADERA COUNTY

A. W. Kitchen has completed his contract for the construction of bridges over Ash and Berenda sloughs on the Pacheco Pass Highway and C. W. Wood has secured the contract for approaches and surfacing.

Bridges and approaches over Ash and Berenda sloughs have been completed and there will be no more detours necessary during high water on this section of the Pacheco Pass Highway.

The paving plant of Hanrahan Company at Berenda was burned down on March 20th. The contractor

started immediately to rebuild the plant for the completion of the work.

MARIPOSA COUNTY

Widening and realigning of the Yosemite all-year highway from Mariposa to Bricburg has been practically completed by state forces. Surfacing will start at once.

Basich Bros. Construction Company is starting surfacing on their contract in Mariposa County.

Widening and straightening of the Bricburg Grade on the Yosemite All-year Highway has been completed by state forces and surfacing is being placed.

Basich Bros. have completed grading work and bridges on their contract on the Mariposa road and have started surfacing.

MENDOCINO COUNTY

The narrow road along the steep bluffs of the South Fork of the Del River, approximately five miles north of Lane's Redwood Flat, is being widened and straightened to a standard width roadway by state forces, and it is expected that approximately two miles of this narrow road will be eliminated before the heavy tourist traffic begins.

MERCED COUNTY

Shoulder widening by maintenance forces from Los Banos Westwily on the Pacheco Pass Highway is making this road safer and more attractive to the motoring public.

NEVADA COUNTY

Resumption is expected soon of the grading between Indian Springs and Soda Springs. The contractors, Callahan Construction Company, were compelled to suspend the work last November on account of heavy falls of snow.

When the work is resumed, all possible speed will be made with a view to completing the construction by the latter part of summer of this year.

Approximately one and one-half months work remains to be done to complete the grading and crushed stone surfacing between Donner Lake and Truckee. Adverse weather conditions caused a suspension during the winter. The contractors, Mathews Construction, expect to finish the work by the middle of May.

Construction will soon commence between Nevada City and Washington Road of 11.7 miles for grading of a roadbed 24 feet wide and surfacing with five inches thick, 20 feet wide, crusher run base with oil treated surface.

This road is a unit of the Tahoe-Ukiah Highway, and will connect Nevada City with a county road leading to the town of Washington on the South Yuba River.

The work will occupy approximately one year to complete.

PLACER COUNTY

It is planned to surface with bituminous macadam the present road between Auburn and Colfax. Work will begin the early part of May and will continue to about the first of October.

The work proposed is that of building up the irregularities of the present surface with bituminous macadam surfacing and grading of shoulders.

Construction will be permitted only one-half width at a time, allowing the other half of the road free to traffic.

The grading of the approaches to the Weimar overhead crossing of the Southern Pacific Railroad is complete on the south side. Included in the contract for this work is the grading of the Bowman overhead

crossing approaches and the surfacing; also grading and surfacing of the Weimar separation approaches, with bituminous macadam. The contractors, Fredrickson & Watson Construction Company and Fredrickson Brothers, are making every effort to complete the work on schedule.

SACRAMENTO COUNTY

Plans and estimate are ready for a proposed improvement of the State Highway between Ben Ali and Sylvan School. A 30-foot concrete pavement between Ben Ali and Del Paso and a 20-foot concrete pavement between Del Paso and Sylvan School, is planned.

The work is expected to be contracted for in July and it is estimated that the road will be eight months under construction.

TULARE COUNTY

Contractor C. W. Wood has completed his contract for concrete shoulders from Goshen Junction to Oakdale School on Route 10.

Placing of premixed oiled surfacing has been started by Contractor Fred W. Nighbert on the section of the Sierra-to-the-sea Highway between Three Rivers and Sequoia Park.

Two miles of pre-mixed oil surface have been placed by Contractor Fred W. Nighbert on Route 10, connecting with the General's Highway in Sequoia National Park.

State forces have started building a masonry wall at a narrow point on Route 10 near Three Rivers, to widen the roadway and protect traffic.

Record of Bids and Awards

AMADOR COUNTY—Between Drytown and Amador City, 2.8 miles of grading. Dist. X, Rt. 65, Sec. B. C. G. Willis & Sons, Inc., Los Angeles, \$111,912.50; Ariss-Knapp Co., Oakland, \$122,193; C. R. Adams, Oakland, \$104,986.20; S. H. Palmer Co., San Francisco, \$102,071.50; J. P. Holland, Inc., San Francisco, \$99,591.90; Geo. Mitchell, Huntington Park, \$124,304.50. Contract awarded to J. P. Holland, Inc.

CALAVERAS COUNTY—Between 2 miles and 4 miles south of Mokelumne Hill, 2.2 miles grading. Dist. X, Rt. 65, Sec. A. Mankel and Staring, Sacramento, \$81,502.80; Jasper-Stacy Co., San Francisco, \$73,527.90; Heafey-Moore Co., Oakland, \$73,811.90; Gobler Const. Co., Los Angeles, \$48,773.10; Arris-Knapp Co., Oakland, \$76,517.60; J. P. Holland, Inc., San Francisco, \$58,298.27; R. Norman Murdoch, Oakland, \$58,681.60; C. R. Adams, Oakland, \$49,990.10; C. G. Willis & Sons, Inc., Los Angeles, \$64,537.90; John F. Collins, Stockton, \$54,968.40; S. H. Palmer Co., San Francisco, \$57,209.60; Schelling and Schelling, Burbank, \$51,842; Lord & Bishop, Oroville, \$76,573.50; Fredrickson & Watson Const. Co., and Fredrickson Bros., Oakland, \$51,387.60; Larsen Bros., Sonoma, \$48,897.50; A. J. and J. L. Fairbanks, South San Francisco, \$48,997.80; E. C. Coats, Sacramento, \$79,295; G. E. Fimmel, Sacramento, \$69,070; The Adams Co., Angels Camp, \$59,965; Young Bros., Berkeley, \$56,097; Isbell Const. Co., Fresno, \$85,965; Tiffany, McReynolds, Tiffany, San Jose, \$55,340.20.

CONTRA COSTA COUNTY—Through Pinole and Hercules, 2.2 miles to be graded and paved with Portland cement concrete and bituminous macadam. Dist. IV, Rt. 14, Sec. A. Jack Casson, Hayward, \$175,591; J. P. Holland, Inc., San Francisco, \$172,595.75; Prentiss Paving Co., San Jose, \$159,905.05; E. B. Skeels, Roseville, \$173,956; Central Construction Co., Oakland, \$178,684.25; Fredrickson & Watson Const. Co., Fredrickson Bros., Oakland, \$160,465.80. Contract awarded to Faving Co., San Jose, \$159,905.

CONTRA COSTA COUNTY—Widening reinforced concrete bridge across Rodeo Creek in the town of Rodeo. District IV, Rt. 14, Sec. E. R. F. Ragland, San Francisco, \$6,338; Edward G. Hart, San Francisco, \$6,280; Samuel C. Rogers, Richmond, \$5,610; McDonald and Maggiora, Sausalito, \$7,997.40. Contract awarded to Samuel C. Rogers.

HUMBOLDT COUNTY—Bridge across Mad River, 4 miles north of Arcata. Dist. I, Rt. 1, Sec. I. Mercer Fraser Co., Eureka, \$79,418; Smith Bros. Co., Eureka, \$82,534.20; M. B. McGowan, San Francisco, \$76,974; H. C. White, Sanger, \$79,938; Butte Construction Co., San Francisco, \$76,948.40. Contract awarded to Butte Construction Company.

HUMBOLDT COUNTY—North and south of Pepperwood, about 1.7 miles to be surfaced with standard road surfacing, crushed gravel or stone. Dist. I, Rt. 1, Sec. D. Smith Bros., Eureka, \$5,250; William C. Elmsore, Eureka, \$5,404. Contract awarded to Smith Brothers.

HUMBOLDT COUNTY—Grading the site for District Office and shops at Eureka. Dist. I. Henry Padgett, Fields Landing, \$3,382; Delose C. Kemp, Crescent City, \$3,827; W. C. Elmsore, Eureka, \$3,560; Mercer-Frazier Co., Eureka, \$4,272; Smith Bros., Eureka, \$3,907; Englehart Paving and Construction Co., Eureka, \$4,717. Contract awarded to Henry Padgett.

KERN COUNTY—Between Wasco and Famosa, 8.9 miles to be graded and paved with asphalt concrete. Dist. VI, Rt. 23, Sec. D. C. W. Hartman, Bakersfield, \$198,769; Steele Finley, Santa Ana, \$199,773.50; Valley Paving & Const. Co., Visalia, \$179,992; Warren Const. Co., Oakland, \$189,341; Force, Curri-gan & McLeod, Oakland, \$183,792; A. Teichert & Son, Sacramento, \$198,401.70; Maarahan Company, San Francisco, \$194,640; J. F. Johnston, Stockton, \$198,038. Contract awarded to Valley Paving Co.

KERN COUNTY—Between 7 miles north of Ricardo and Freeman, 10.2 miles to be graded and surfaced with oil treated crushed gravel. Dist. IX, Rt. 23, Sec. D. Braun, Bryant & Austin, Culver City, \$130,046; G. W. Ellis, Glendale, \$103,281.70; Bartlett & Mathews, Pasadena, \$133,734; Southwest Paving Co., Los Angeles, \$122,279. Contract awarded to G. W. Ellis.

KERN COUNTY—Between Mojave and 7 miles south of Cinco, 9.9 miles grading and surfacing with oil treated crushed gravel. Dist. IX, Rt. 23, Sec. B. Southwest Paving Co., Los Angeles, \$104,934; Isbell Construction Company, Fresno, \$145,262; Hall-Johnson Co., Alhambra, \$126,714; Basich Brothers Const. Co., Los Angeles, \$127,638; Bartlett & Mathews, Pasadena, \$92,949.40; A. J. Grier, Oakland, \$133,307; G. W. Ellis, Glendale, \$118,111; Braun, Bryant & Austin, Culver City, \$118,068; Tiffany-McReynolds, Tiffany and McDonald, San Jose, \$118,312; Gibbons and Reed Co., Burbank, \$144,354. Contract awarded to Bartlett & Mathews, Pasadena.

LOS ANGELES COUNTY—Between $\frac{1}{2}$ mile north of Kellys and $\frac{1}{2}$ mile north of Sandbergs, 6.1 miles to be paved with bituminous macadam. Dist. VII, Rt. 4, Sec. C. Sully-Miller Contracting Co., Long Beach, \$109,290; A. J. Grier, Oakland, \$114,790; C. W. Hartman Construction Co., Bakersfield, \$112,915; Gibbons & Reed, Burbank, \$105,155; Holdener Const. Co., Sacramento, \$105,290. Contract awarded to Gibbons and Reed.

LOS ANGELES COUNTY—For furnishing material and labor in connection with the reconstruction of pipe lines and irrigation systems between Glendora and Claremont. Dist. VII, Rt. 9, Sec. I.J. and C. B. R. Davison Const. Co., Monrovia, \$9,405.25; Thomas Haverly Co., Los Angeles, \$10,155.40. Contract awarded to B. R. Davison Const. Co.

LOS ANGELES COUNTY—Between Glendora and Claremont, moving buildings from state highway right of way. Dist. VII, Rt. 9, Sec. I.J. and C. Doyle McMillin, Whittier, \$6,573; Star House Movers, Inc., Los Angeles, \$8,490; W. C. Cline, Upland, \$9,061; C. H. Basore, Pasadena, \$8,598. Contract awarded to Doyle McMillin, Whittier.

MERCED COUNTY—Between Bradley and RR King and the east county boundary, 13.1 miles, hauling and spreading gravel. Dist. VI, Rt. 18, Sec. A. J. F. Collins, Stockton, \$6,700; John G. Chigris & Pitri Sutsos, San Francisco, \$9,790; Basich Bros. Const. Co., Los Angeles, \$9,700; W. C. Colley, Coalinga, \$8,633. Contract awarded to J. F. Collins of Stockton.

NEVADA COUNTY—Nevada City to 1 mile west of Washington Road, 11.7 miles grading and surfacing with oil treated crusher run base. Dist. III, Rt. 15, Sec. C. Arris-Knapp Co., Oakland, \$287,003; Robinson-Roberts Co., Los Angeles, \$360,040.80; Healy Tibbits Const. Co., San Francisco, \$367,818; Nevada Contracting Co., Fallon, Nevada, \$317,424; Wren & Greenough, Portland, \$203,829; Raggio & Sartoris, San Francisco, \$345,780; E. C. Coates, Sacramento, \$281,231; Isbell Const. Co., Fresno, \$371,370; Marsh Bros., & Gardiner, San Francisco, \$368,281.80; Twohy Bros. Co. and J. F. Shea, San Francisco, \$347,118; Guy F. Atkinson, Portland, \$357,333; Schuler & McDonald, Oakland, \$384,121; Mathews Const. Co., Sacramento,

\$359,727; Guy F. Pyle and Ernest C. Hall, Eugene, Oregon, \$361,417; Holdener Construction Co., Inc., Sacramento, \$277,880; D. A. Foley Const. Co., Los Angeles, \$310,576; T. E. Connolly, San Francisco, \$365,659; Henstreet and Bell, Marysville, \$316,840; Geo. Mitchell Co., Huntington Park, \$332,842; C. R. Adams, Oakland, \$263,482; A. Teichert & Son, Sacramento, \$333,942. Contract awarded to C. R. Adams of Oakland.

SACRAMENTO COUNTY—Between North Sacramento and Del Paso Park, 1.8 miles to be graded and paved with asphalt concrete. Dist. III, Rt. 3, Sec. B. McGillivray Const. Co., Sacramento, \$60,755; A. Teichert & Son, Sacramento, \$54,794. Contract awarded to Clark and Henery Const. Co., San Francisco, \$53,602.

SAN DIEGO COUNTY—Across Pine Valley Creek, 16 miles east of Alpine, reinforced concrete girder bridge and approaches to be graded. Basich Bros. Const. Co., Los Angeles, \$51,959.75; Chas. & F. W. Steffen, San Diego, \$62,471.35; deWaard & Son, San Diego, \$53,123; Linderman & Ducker, Inc., Harbor City, \$48,852; John Simpson & Co., Los Angeles, \$53,933; McWilliams & Ritchey, Los Angeles, \$72,875; R. H. Downer, San Diego, \$61,166.80; Whipple Engineering Co., Monrovia, \$51,291.75; E. S. Johnson, Pasadena, \$49,921; Oberg Bros., Los Angeles, \$67,272.65. Contract awarded to Lindermann & Kueker of Harbor City, California.

SAN LUIS OBISPO COUNTY—From Arroyo Grande to Pismo Beach, 3.28 miles to 20- and 30-foot Portland cement concrete pavement. Dist. V, Rt. 2, Sec. E. Cornwall Construction Co., Santa Barbara, \$132,712; J. F. Knapp, Stockton, \$139,250; Prentiss Paving Co., San Jose, \$133,312; M. J. Bevanda, Stockton, \$139,016. Contract awarded to Cornwall Const. Company.

SAN LUIS OBISPO COUNTY—Maintenance Shop Building and truck shed, pump house and oil house. Dist. V. W. J. Smith, San Luis Obispo, \$17,897; Theo. M. Maino, San Luis Obispo, \$18,690. Contract awarded to W. J. Smith.

SANTA BARBARA COUNTY—Between Benham and 2 miles south of Carpinteria, 1.2 miles grading and paving with Portland cement concrete and bituminous macadam. Dist. V, Rt. 2, Sec. G-H. Chas. W. Wimmer, Santa Barbara, \$98,551; G. T. Malcolm, Walnut Creek, \$102,566; Sam Hunter, Santa Barbara, \$103,416; S. H. Palmer, San Francisco, \$118,297; McWilliams & Ritchey, Los Angeles, \$122,042; John C. Gist, Arcadia, \$98,029; Nelson & Sloan, Chula Vista, \$87,728; The Callahan Const. Co., Los Angeles, \$93,446; J. G. Donovan & Son, Los Angeles, \$94,499; Bert Calvert, Los Angeles, \$92,757; M. J. Bevanda, Stockton, \$91,757; Schelling & Schelling, Burbank, \$92,228; McCray Co., Los Angeles, \$85,874.70. Contract awarded to McCray Company.

SHASTA COUNTY—Repairing bridge across Sacramento River about 1 mile east of Redding. Dist. II, Rt. 28, Sec. A. Lord and Bishop, Oroville, \$34,800; M. B. McGowan, San Francisco, \$31,564; J. P. Brennan, Redding, \$32,318; Stephenson Const. Co., San Francisco \$33,153; R. E. McKenzie, Gerber, \$33,136. Contract awarded to M. B. McGowan of San Francisco.

SISKIYOU COUNTY—At Spring Hill near Mt. Shasta City, 0.7 of a mile of grading. Dist. II, Rt. 3, Sec. A. H. J. Kennedy and Daniel Boyles, Oakland, \$49,500; Mathews Const. Co., Sacramento, \$36,359; A. J. & J. L. Fairbanks, South San Francisco, \$41,367; G. E. Finnell, Sacramento, \$35,764; Southern Oregon Const. Co., Klamath Falls, \$35,764; C. R. Adams, Oakland, \$38,682; J. P. Breunon, Redding, \$31,418; J. P. Compton, McMinnville, Oregon, \$50,611; Young Bros., Berkeley, \$28,771; Schelling & Schelling, Burbank, \$39,202; Jones & Stacy, Newhall, \$40,206; Dunn and Baker, Klamath Falls, \$40,391. Contract awarded to Young Bros. of Berkeley.

SOLANO COUNTY—Westerly boundary and $1\frac{1}{2}$ miles west of Cordelia, 2.3 miles grading and bituminous macadam pavement. Dist. X, Rt. 8, Sec. A. Tieslau Brothers, Berkeley, \$87,911.70; Mankel and Staring, Sacramento, \$91,748.50; G. E. Finnell, Sacramento, \$93,655.75; J. E. Johnston, Stockton, \$92,798; Fredrickson & Watson and Fredrickson Bros., Oakland, \$87,802.40; E. B. Skeels, Roseville, \$95,805. Contract awarded to Fredrickson & Watson.

TUOLUMNE COUNTY—Between 1 mile northwest of Shaw's Flat and the Sonora-Columbia road, 1.6 miles of grading. Dist. X, Rt. 65, Sec. A. E. N. Noble and Edgar Noble, Marysville, \$17,459.90; Wm. C. Colley, Coalinga, \$24,251; Mankel & Staring, Sacramento, \$28,512; G. E. Finnell, Sacramento, \$23,082; Gannon & McCarty, Stockton, \$21,906; D. C. Pollis, Compton, \$19,411.75; Lilly Willard & Biasotti, Stockton, \$22,001; Larsen Bros., Sonoma, \$21,983; The Adams Co., Angels Camp, \$27,900. Contract awarded to E. N. and Edgar Noble of Marysville.

STATE HIGHWAYS IN CALIFORNIA SHOWING THE PRIMARY AND SECOND-ARY ROAD SYSTEMS AND THE DIVISION OF THE STATE UNDER THE BREED BILL.



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California Highways and Public Works



Official Journal of the Division of Highways

Department of Public Works

State of California

MAY
JUNE

1929



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New State Highway Legislation Covers Many Important Subjects

By C. C. CARLETON, Chief of the Division of Contracts and Right of Way

THE California Legislature, that adjourned May 15, 1929, has been most responsive to the needs and suggestions of the Division of Highways, State Department of Public Works, in the matter of forward looking, public serving highway legislation.

All bills initiated or endorsed by the highway division were duly passed by the legislature, but many valuable amendments were added to the original bills by the legislators themselves, indicating the intelligent and abiding interest taken by the members of the legislature in highway affairs which so vitally concern every constituent in their respective districts.

Some of the legislation involved sweeping changes of fundamental bridge and highway policies and traditions in this state and demonstrated that an All-California vision has developed and that the period of selfish and sectional preferences and prejudices is passing, it is to be hoped for all time.

A brief review of legislation affecting state highway activities now becoming new law is given herewith.

SCIENTIFIC SURVEY OF SECONDARY HIGHWAY SITUATION

Senate Concurrent Resolution No. 19, Chapter 25, Senator Handy.

A concurrent resolution was introduced in the Assembly by Assemblyman Jespersen, and passed by the Assembly, but Senator Handy and Assemblyman Jespersen, Chairmen of the Roads and Highways Committees of the

Senate and Assembly, respectively, agreed to the final advancement of Senate Concurrent Resolution No. 19, which was duly adopted.

This resolution empowers the State Department of Public Works to launch a scientific engineering and economic survey of the state highway system, to the end that a comprehensive report shall be made available to the 1931 legislature, with recommendations as to

routes not now in the state highway system which, either by reason of the large volume of state traffic that they are now carrying, or by reason of the relief that they would afford to heavy traffic upon present state highways, or as highways serving as important interstate links, might properly be included in and added to the secondary state highway system.

By the adoption of this resolution a new and unique chapter was written into the state highway history of California.

Genuine constructive statesmanship and individual unselfishness were shown by the unanimous support of this procedure by the members of the 1929 legislature.

The state administration had announced that

it was opposed to the policy of adding more roads to the state highway system until present roads were more adequately cared for and until a more thorough study of the entire state-wide situation could be made.

The wisdom of this policy soon became recognized and many bills for specific road projects were permitted to languish and die in committee by their authors, who by their magnanimous action are entitled to great credit.



C. C. CARLETON.

Perils of the Desert Are Conquered by State Highways

By J. P. BAUMGARTNER, Member of the California Highway Commission

EVER since his appointment to the Highway Commission, the writer has been profoundly impressed with the importance, not only to southern California, but to the entire state, of having good roads leading into California from Arizona and Nevada. Fortunately, the other members of the commission and Director of Public Works Meek have been likewise impressed.

Not only do these roads carry most of the transcontinental traffic both ways, but the demands upon them of comparatively local traffic, incident to the industrial and recreational development of the desert country, are very large and increasing constantly.

It will be interesting, therefore, and instructive, to outline the largest desert highway program ever undertaken by the Highway Commission—a program that is now well under way and the extent of which is fully realized by very few people.

PERILS HAVE GONE

A review of recent activities on desert interstate highways of southern California reveals that the peril of the desert road has already become a thing of the past. The waste of dreary sands that menaced the lives of the fathers and mothers of the present generation are now fast becoming transformed into playgrounds for their children. Desert trails have either become or within a few years will be veritable boulevards. Today, instead of repelling travel the deserts of southern California with their strange formations, their beautiful coloring, their fantastic flowers, their spectacular history recorded in rock and sand, are attracting visitors the world over.

Once classed as places to be shunned, they are listed now among the attractions de luxe of the wonderful Southland.

The story of the manner in which highways have conquered the desert is one of the great epics, now in the making, in the colorful history of southern California. Notable in

this story is the tale of the Imperial Valley-Yuma state highway. Sandstorms and shifting dunes had made this road a terrifying area to travelers forced to attempt it. Tragedy stalked every mile.

Then there came, in 1916, during the earlier days of state highway construction, the old plank road. These tracks of planks were often buried by shifting dunes or covered by sand blown across them in storms. There was always the fear of meeting someone on a section of the road where there was no turnout.

After each storm the planks had to be dug out and raised or lowered to fit conditions imposed by new sand dunes, either created or shifted by the storm. Despite the plank road the desert still reigned supreme.

An intensive engineering study was undertaken by the California Highway Commission to see if some method might not be found whereby a more satisfactory

highway could be built across these shifting sand dunes. Many plans were considered and it was finally decided that by building a road on sand fills higher than the fast-moving sand dunes, the problem could be solved.

A record of sand movements was kept over many months. It was found that only the small sand dunes moved fast. Those over thirty feet high were found to move very slowly. The movement of dunes from 200 to



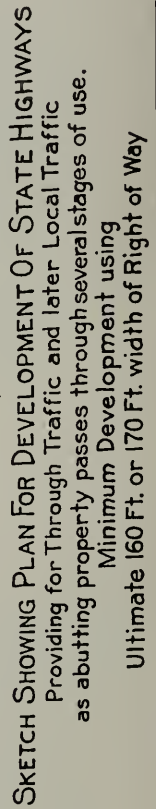
J. P. BAUMGARTNER.

(Continued on page 30.)

Desert Highways of California



Upper left, State Highway south of Banning in Riverside County; Upper right, Across the Sand Dunes in Imperial County; Center, Highway through broken lava in San Bernardino County; Lower left, Mountain Springs Grade in Imperial County; Lower right, Oiled surface near Victorville in San Bernardino County.



Typical Road Sections

By FRED GRUMM, Engineer of Surveys and Plans

ADOPTION of standard practice, in so far as possible, for the location upon the right of way of trees, pole lines, and other public utility facilities, is not only desirable but practically imperative if we wish to provide economically for the maximum development and use of the right of way looking toward the greatest service to the traveling public. Realization of this fact lead, after considerable study, discussion and conferences, recently, to the adoption of the several typical sections for various widths of right of way. These typical sections will be found illustrated on another page. They may be briefly described as follows:



FRED GRUMM.

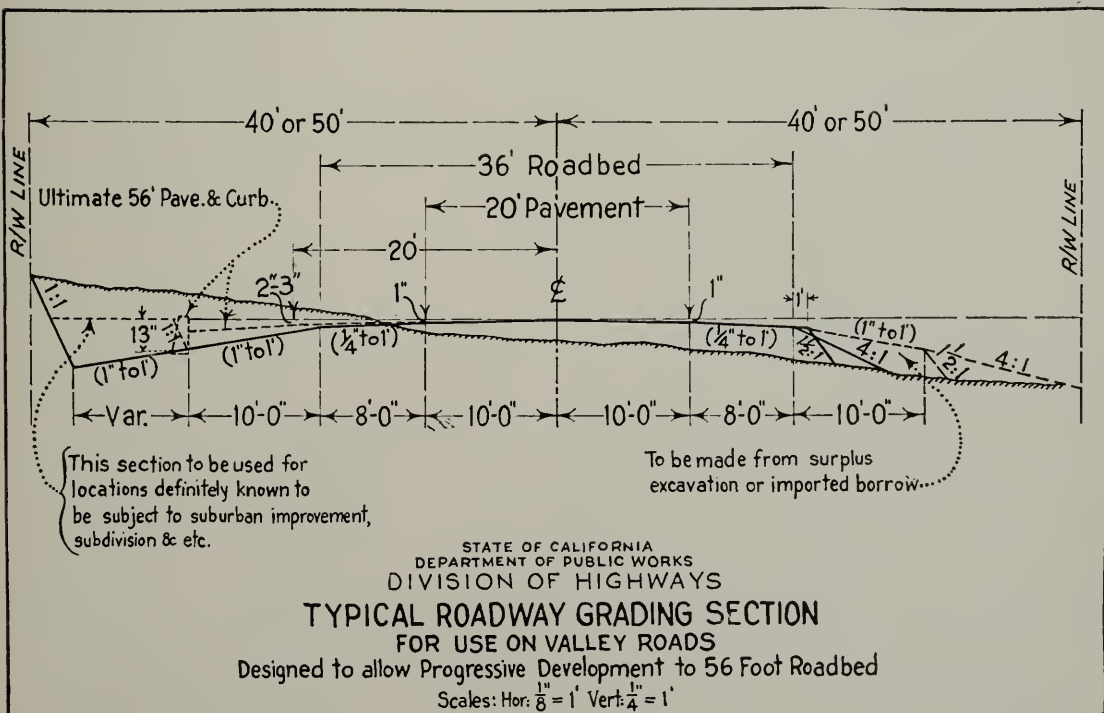
- (1) A typical roadway grading section for use on valley roads;
- (2) A typical section showing utilization of 80-foot right of way;
- (3) A typical section showing utilization of 100-foot right of way;

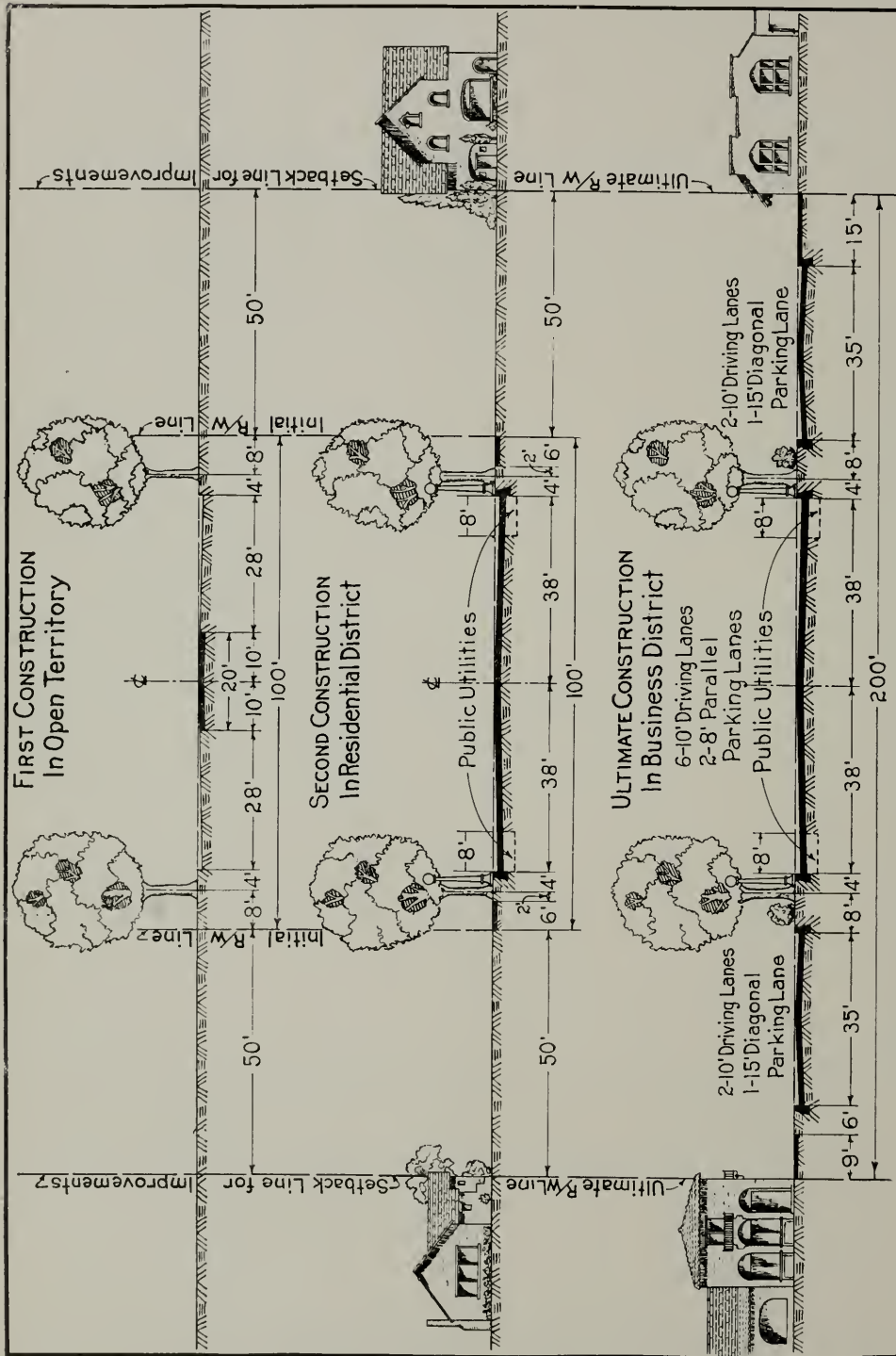
(4) A typical section showing progressive development of roadway and utilization of 90-foot right of way for state highways adjacent to railroad lines;

(5) Sketch showing plan for development of state highways providing for through traffic and later local traffic as abutting property passes through several stages of use. Minimum development using ultimate 160-foot or 170-foot width right of way;

(6) Sketch showing plan for development of state highways providing for through traffic and later local traffic as abutting property passes through several stages of use. Maximum development using ultimate 200-foot width of right of way.

The first, a typical roadway grading section for use on valley roads is so designed as to eliminate borrow pits, substituting therefor a "turnpike section," providing for taking all available excavation material from within the right of way for the construction of the standard 36-foot width of roadbed and still remaining within the lines and limits of the ultimate 56-foot development. It is to be used, wherever applicable, in valley or easy country

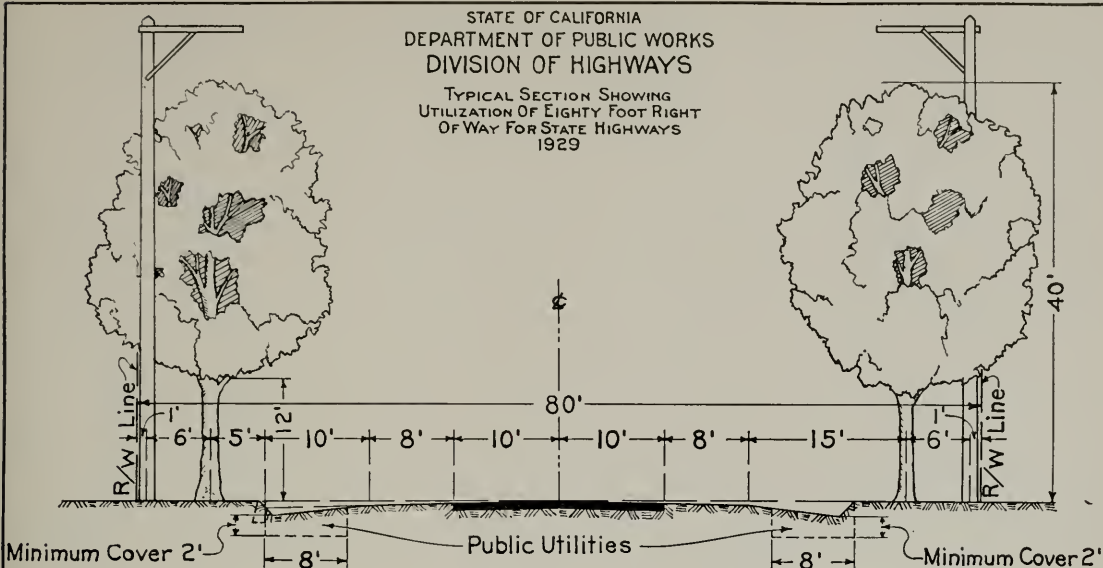




SKETCH SHOWING PLAN FOR DEVELOPMENT OF STATE HIGHWAYS
Providing for Through Traffic and later Local Traffic
as abutting property passes through several stages of use.
Maximum Development using
Ultimate 200 Ft. width Right of Way

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

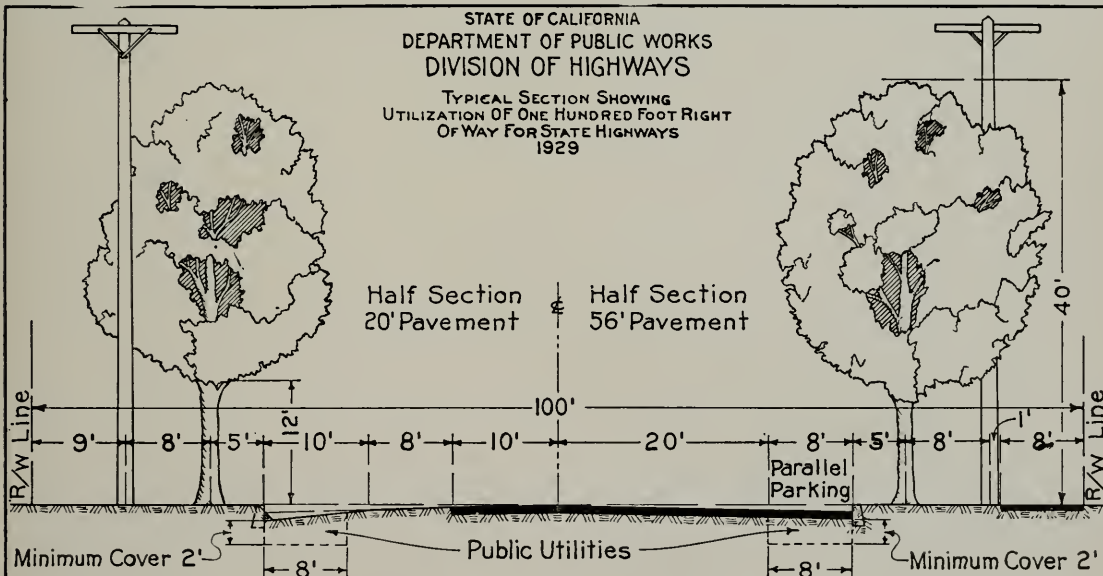
TYPICAL SECTION SHOWING
UTILIZATION OF EIGHTY FOOT
RIGHT OF WAY FOR STATE HIGHWAYS
1929



T.P.H. 3-22-28

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

TYPICAL SECTION SHOWING
UTILIZATION OF ONE HUNDRED FOOT
RIGHT OF WAY FOR STATE HIGHWAYS
1929



T.P.H. 3-23-29

on programmed projects which are being or will be prepared for future improvement. It is particularly applicable to construction and reconstruction projects on routes 3, 4 and 7 in the San Joaquin and Sacramento valleys and on large portions of route 2.

An inspection of a number of the layout plans and cross-sections in the valley country indicate that: (a) The average cut bank near the right of way line is less than two feet; (b) imported borrow is often needed for a 36-foot roadbed; (c) the full utilization of excavation

material within the right of way, as indicated on the section, will usually not result in waste in the construction of a 36-foot roadbed—in fact often will not make the fills and therefore additional imported borrow is necessary.

The section was developed to make use of all of the excavation within the right of way for the construction of the present 36-foot roadbed and was designed so that no excavation would be made below the subgrade elevation of the future 56-foot pavement. Provision is made for taking care of surplus excavation which might develop at certain points. This is to be placed in embankment having slopes similar to those in excavation and to a subgrade elevation for future pavement.

The use of this section in the flat country will provide flat slopes beyond the shoulder of the roadbed, extending in excavation practically to the right of way line, and consequently making this portion of the right of way more easily accessible for maintenance purposes. Where it is definitely known that abutting property is subject to early improvement by subdivision and the construction of business or semibusiness buildings, excavation and embankment can be made, as indicated on the typical section, to provide for placing of curb and sidewalk.

The second typical section shows the utilization of 80-foot right of way. The proper placement of the trees and pole lines is shown

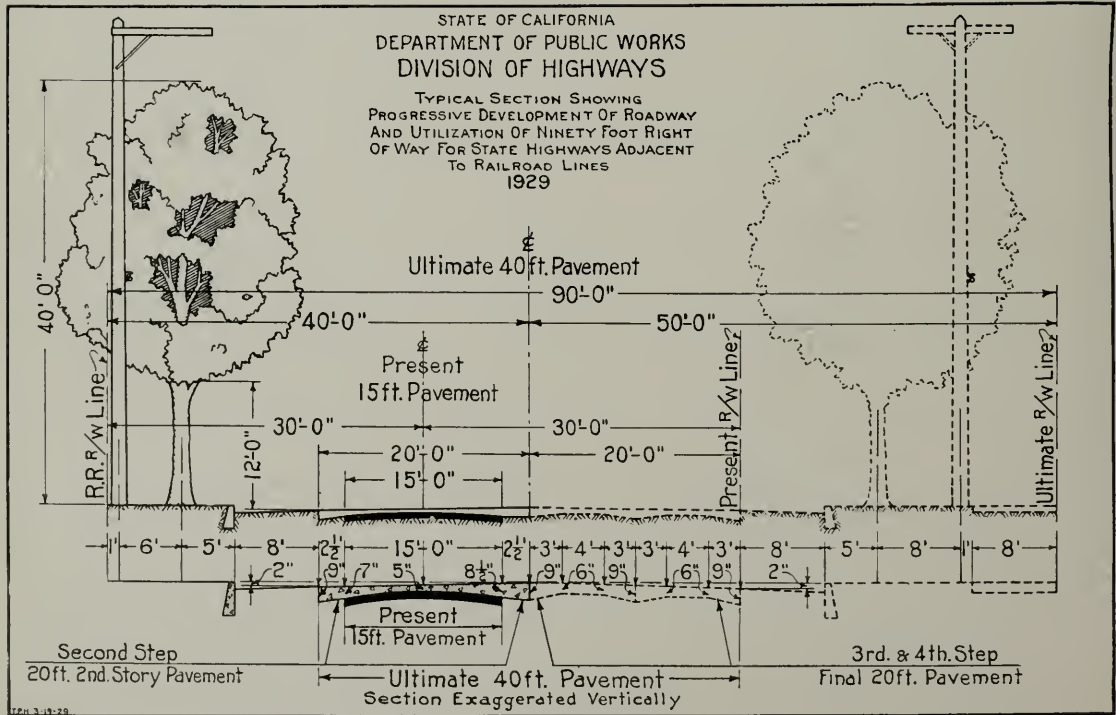
which permits of future development of the roadbed to an ultimate 56-foot width.

The third typical section shows the utilization of 100-foot right of way, on which is indicated the location of trees, pole lines, and sidewalks. This section is also designed to permit the construction of an ultimate 56-foot pavement.

The fourth typical section shows the utilization of 90-foot right of way for state highways adjacent to railroad lines. It has been primarily designed to care for the reconstruction and widening of our present narrow pavements in such locations, looking toward ultimate future development of the 56-foot width in a progressive manner without incurring the loss or reconstruction of the first stages of the work. It embodies the idea of sloping the 20-foot pavement, undertaken as the first reconstruction step, in one direction, permitting the addition of future widening without disturbing this original construction.

It is obvious that this method of development preserves the original 15-foot pavement without loss, permits the addition of resurfacing where flush shoulders have been constructed on the old 15-foot pavement, permits the second and third step of development without loss of previous installation or thickening of the same with the attending necessity of continually raising the grade.

(Continued on page 31.)



One Price We Pay for Highways

Grant Merrill, maintenance superintendent for seventeen years in Alpine County, is confined in a Sacramento hospital as a result of a powder explosion on May 17, in which his right hand was blown from the arm.

Mr. Merrill was investigating the depth and condition of snow on the Red Lake grade of the Kit Carson Pass when the accident occurred. Tests were being made, preliminary to instructing maintenance crews to begin the work of snow removal. Premature explosion of a cartridge that he was dropping into a test hole blew Mr. Merrill's hand from the arm and injured him in many places about the body.

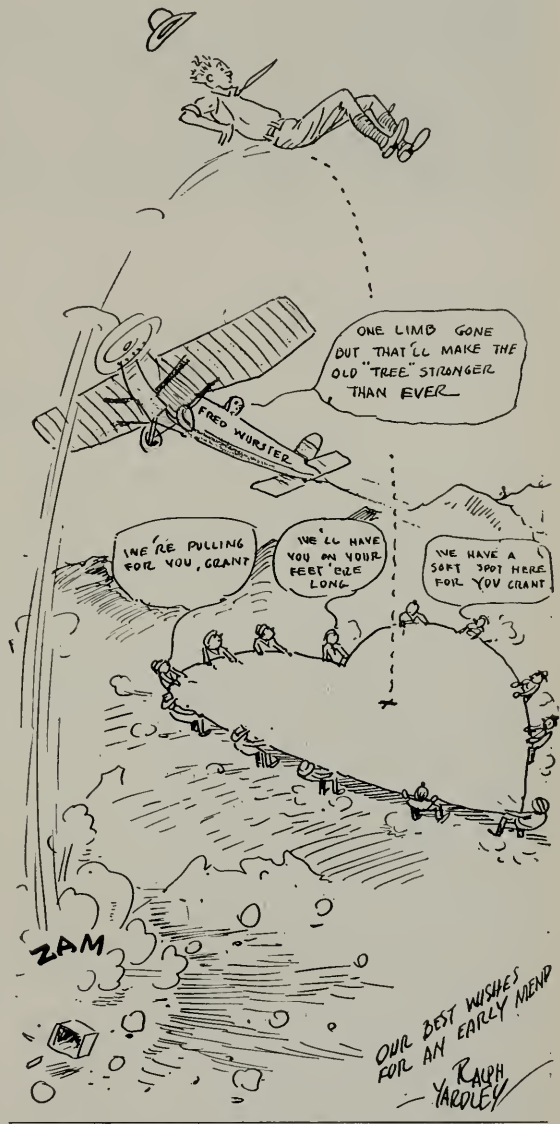
Despite the severity of his injury Superintendent Merrill retained consciousness and directed two Indian assistants to bind up the injured arm with sacks and to tie arteries with string taken from luncheon boxes.

With first aid administered, the difficulty confronted the men of reaching Mr. Merrill's auto fully a mile away. Deep snowdrifts, softened by sunshine, made the going difficult. It proved impossible for the Indians to carry the injured man across the soft drifts. Finally he laid down upon the snow and directed one of the Indians to haul him by the legs across the drifts, while the other steered his head and shoulders. The futility of this method being apparent to him, Mr. Merrill mustered enough strength to walk over the remaining quarter of mile of snow to the car.

One of the Indians, while not experienced in driving, was able to take the wheel and under Mr. Merrill's direction, his home near Woodfords was finally reached. Physicians 30 miles distant were summoned. After a first aid operation, they advised that Mr. Merrill be rushed to Sacramento. Mrs. Merrill and Mrs. Dangberg, sister of the injured man, drove him to Kyburz over a road that had been cleared of snow but a few days. At Kyburz an ambulance was waiting and Mr. Merrill was brought the remaining distance in it.

Other than the complete loss of his right hand, the other injuries were not permanent and Mr. Merrill is rapidly recovering.

Mr. Merrill is a friend of sportsmen all over northern California, and the news of his injury occasioned widespread regret both



among them and in highway circles. Attached is one of the many messages of cheer sent to him. This is by Ralph Yardley, cartoonist of the Stockton Record.

COLORADO has 3797 miles of surfaced state highways, of which 343 miles is hard surfaced, according to the latest check-up. For several years the highway department has been extending the surfaced mileage under the slogan "More Miles for Less Money."



Burning the roadside after vegetation has been sprayed with oil.

Protecting Property From Fire Starting Along State Highways

NOTABLE PROGRESS has been made this year in the development of roadside burning methods, intended to protect crops and property adjacent to highways from losses due to fires originating upon the right of way.

Some 750 miles of the highway roadsides were scheduled for spraying and burning this season at an estimated expenditure of \$35,000. The greater part of this work has been completed. In some sections it was necessary to stop the work due to fire hazard.

In the Los Angeles territory there was some difficulty in carrying on our operations to meet the requirements of the various hours, generally at night, and a larger crew was required by some wardens than by others. Excellent cooperation has been received from the Division of Forestry and they are much interested in the success of the work.

An inspection of 50 miles of burning did not indicate any fire hazard. Spraying had not been done adjacent to service stations or buildings, and if the dried grass was accidentally ignited the worst damage apparently would be a few burned fence posts. The grass on each side of the sprayed strip is still too green to burn and we plan to have our work completed before there is a hazard from that source.

Methods of spraying and burning roadsides were first tried out in District X in February using a mixture of distillate and fuel oil and of gasoline and fuel oil. The grass was burned immediately after the application of the oil. Fair results were obtained.

In the meantime diesel oil had been used in the vicinity of Rio Vista, and it was found that the grass would burn readily after using this material. The diesel oil costs about 4 cents per gallon as against $7\frac{1}{2}$ cents for the gasoline and fuel oil mixture and apparently is just as effective in killing the grass.

The plan adopted as a result of various experiments is as follows:

Diesel oil is spread by tank truck equipped with compressor pump and spray at the rate of 1/16 to 1/10 gallon per square yard on the 5-foot strip adjacent to fence lines opposite grain, pasture or wooded areas where fire hazard exists. It was not felt necessary to spray areas adjacent to orchards or railroads right of way. After the spraying is done it is left for ten days or two weeks before burning, in order to permit as much new vegetation as possible to get a start. The burning operations will then destroy the new growth and the maximum benefit will be secured.

The growth remaining between the shoulder line and the cleared area is mowed or burned. The cleared area will serve as an effective fire guard.

A program for next season's operations will be worked up this fall. The work done this year will reduce the fire hazards materially but it was necessary to work out the method and develop the equipment as the work progressed. Next season we can apply our experience and improve both equipment and methods.

A program of clearing roadsides in forested areas is also being planned.

Summary of 1928 Pavement Construction

By E. WITHERCOMBE, Assistant Construction Engineer

THE outstanding accomplishment in 1928 was the reduction in roughness on asphaltic concrete surfaces by machine methods. Districts six and seven, with their remarkable records for machine finished work, have set a mark of accomplishment that was considered next to impossible in 1926. Without further mechanical improvements these reductions no doubt represent the ultimate to be obtained. The entire organization attached to this class of work, however, are giving thought to improving existing methods, and it is not impossible that in the near future just as spectacular further reductions may be accomplished.

PORTLAND CEMENT CONCRETE PAVEMENTS

Mix—Methods of design of mixtures, by the field determined aggregate voidage system, have not been changed in the past season. A more liberal treatment of Water Concrete Ratio (a Construction Department designation), has been countenanced to insure workable concrete. In order to maintain strengths, greater attention has been paid to the combining of coarse aggregate to produce low voidages and thus reduce the amount of sand necessary in the mix. That this course has been justified is evidenced by an increase in average strengths in four of the six districts having this type of construction.

Design—Thickness of slab remains practically the same as in former years. Length of slab has been decreased universally to 20 feet with provision for expansion every 60 feet. The intermediate joints being of the weakened plane type. A double line of one-half-inch bars in a vertical plane circumscribe the entire panel, the longitudinal bars pro-

jecting through the joint at one end of the panel, the projection covered with a metal sleeve to break the bond. Metal chairs are used to support the steel and are left in place.

Expansion is provided for with one-half-inch thickness of permoulded sponge rubber. The load is bridged across the slab ends by three three-quarters-inch round dowel steel bars 24 inches in length spaced at intervals between the two sets of marginal bars. Half the length of the dowels and the projecting ends of the marginal bars are fitted with metal sleeves with provision for expansion at the ends. The four marginal bars through the weakened plane joint are considered adequate support as the natural break taken by the slab is more or less irregular and offering some support from direct contact.

Multiple joints have resulted in an increase in roughness, but it is believed the improved appearance of the pavement and the prolonged life will warrant the small sacrifice in riding qualities. Test sections of pavement constructed in the past have demonstrated after three

years use that 20-foot panels are practically free from contraction cracking, while increasing this length to 25 feet materially increases the cracking tendency.

Construction—Central proportioning of the three sizes of aggregate remains the same except that proportioning by weight is required on fine aggregate. On future work both fine and coarse aggregates will be proportioned by weight.

Mixing equipment is the same as has been used in past years and average daily output remains practically the same. Use of marginal steel has resulted in construction in 10-foot

CONSTRUCTION RECORDS MADE DURING 1928 ON CALIFORNIA HIGHWAYS

PORTLAND CEMENT CONCRETE

Record for smoothness—Resident engineer, C. M. Butts; Fredrickson & Watson Construction Company, Contractor; contract between Galt and Arno, Sacramento County.

Record for average concrete strength—Resident engineer F. C. Fosgate; Hanrahan Company, contractor; contract between Ignatio and Gallinas Creek, Marin County.

Record for daily yardage—Resident engineer, C. M. Butts; Fredrickson & Watson Construction Company, contractor; contract between San Joaquin River and French Camp, San Joaquin County.

ASPHALTIC CONCRETE

Record for smoothness—Resident engineer, W. D. Eaton; Gibbons & Reed, contractor; contract between Monrovia and Azusa, Los Angeles County.

Record for best hand finished job—Resident engineer, J. F. Knapp; California Construction Company, contractor; contract between the county fair grounds and Hanford, Kings County.

Record for density of pavement surface—Resident engineer, J. M. Hollister; Jahn & Bressi, contractor; contract between Seeley and El Centro, Imperial County.

Record for production—Resident engineer, W. D. Eaton; Gibbons & Reed, contractor; contract between the county fair grounds and Hanford, Kings County.

District	County	Route	Section	Location	Miles	Contract	Contractor
PORTLAND CEMENT							
III....	Glenn.....	7	C	Through Orland.....	1.09	93TTC1	C. W. Wood.....
IV....	Marin.....	1	A	Ignacio-Gallinas Ck.....	4.60	94EC7	Hanrahan Co.....
V....	San Luis Obispo.....	2	E	Pismo-San Luis Obispo.....	8.10	95FC2	J. F. Knapp.....
V....	Monterey.....	2	A	Salinas-Santa Rita Road.....	1.86	95EC2	Chas. Wimmer.....
VII....	Orange.....	2	E	Anaheim-Fullerton.....	.84	07FC1	Bartlett & Mathews.....
VII....	Ventura.....	2	B	4 miles east of Camarillo.....	.22	07FC2	Silveria & Robbins.....
VII....	Orange.....	2860	A & C	San Juan Creek-Serra.....	.57	521	P. R. Dennis Const. Co.....
VII....	Los Angeles.....	9	A	South San Fernando-Sunland.....	0.18	07FFC2	S. W. Gleim.....
VII....	Orange.....	2	A	West of San Clemente.....	0.19	07FFC1	Steele Finley.....
VIII....	San Bernardino.....	26	B	Redlands, 1/2 mile N. Riverside Co. line.....	4.80	98FC1	Matich Bros.....
X....	San Joaquin.....	5	B	San Joaquin Road-French Camp.....	6.81	910EC6	Frederickson-Watson Con. Co.
X....	Sacramento.....	4	A	Galt, 1 mile south of Arno.....	4.24	010EC2	Frederickson-Watson Con. Co.

PORTLAND CEMENT

IV....	Ala-SC1.....	5	C & A	Warm Springs Jct.-Milpitas.....	3.41	94EC3	Allied Contractors, Inc.....
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ASPHALTIC CON

District	County	Route	Section	Location	Miles	Contract	Contractor
III....	Sacramento.....	3	B	North Sacramento-Del Paso Park.....	1.20	03EC1	Clark & Henry.....
IV....	Marin.....	1	B	Through Ross.....	0.76	94EEC1	Pacific States Const. Co.....
IV....	Ala-SC1.....	5	C & A	Warm Springs Jct.-Milpitas.....	4.02	94EC3	Allied Contractors, Inc.....
IV....	CC.....	14	A	Richmond-San Pablo Creek.....	1.30	04EC2	Warren Const. Co.....
VI....	Tulare.....	4	F	Tulare-1 1/2 miles south of Plaza Garage.....	6.09	06FC1	Valley Paving & Const. Co.....
VI....	Madera.....	4	A	Thorsa-Arcola School.....	6.46	96EC2	Callahan Const. Co.....
VII....	Kings.....	10	C	County Fair Grounds-Hanford.....	0.70	06EC3	California Const. Co.....
VII....	Los Angeles.....	9	G	Monrovia-Azusa.....	3.46	97FC5	Gibbons & Reed Co.....
VII....	San Diego.....	12	A	San Diego-La Mesa.....	2.26	97F5	R. E. Hazard Co.....
VIII....	San Bernardino.....	9	A B & C	Cherry ave-San Bernardino.....	9.29	98FC3	Steele Finley.....
VIII....	Imperial.....	26	F	Through Imperial.....	1.00	08FC1	R. E. Hazard Co.....
VIII....	Imperial.....	12	C	Seeley-El Centro.....	7.23	98FC4	John & Bressi.....
X....	Stanislaus.....	4	A & B	North of Ceres.....	0.20	910EC4	Standard Paving Co.....

widths. With the adoption of marginal steel, pouring from the side became necessary and considerable difficulty was experienced, in all types of pavers, with segregation in the mixer bucket as it was being loaded with the boom inclined at a considerable angle from the axis of the machine. This difficulty threatened to force the use of smaller aggregate or increased amounts of fine aggregate in order to insure dense concrete. Through the efforts of Resident Engineers C. M. Butts of District X and A. N. George of District VII, two devices were perfected to overcome this feature, one or the other of which is applicable to any make of paver and is a standard requirement on California work.

Methods of finishing have not been changed in the past season. With the advent of construction in 10-foot widths, it was found by those contractors pouring the larger average daily yardages that two mechanical finishers were a necessity in order to properly handle the output without delays.

Curing methods remain the same as of the past season with a water period of eight days and opening at 14 days or earlier on special projects where climatic

conditions are favorable the exact age of opening depending upon the flexural strength developed by beams cast and broken on the job.

Result of Tests.—The average strength of concrete, as determined by cylindrical casts made on the job and broken in the laboratory, for 28-day age, on individual paving projects ranged from 3190 pounds to 4980 pounds per square inch compressive strength. The average for the state in 1928 was 4235 pounds. This average falls below the 1927 average by 275 pounds and represents an increase in strength in four districts, but a decided decrease in two districts.

One project, which included concrete shoulder construction, was built in 1928 and gave an average strength of 3895 pounds per square inch.

Check cores from pavements are frequently taken after opening. These cores are taken under the direction of the laboratory operating independent of either the district or the construction department. These cores invariably show an increase over the strengths as determined by cylinders cast on the job. The construction department has felt that the job cylinders do not always represent the full strength of the con-

Resident Engineer	Street Assistant	Average strength of concrete at 28 days pounds per sq. inch	Average yardage laid per day	Average daily variation in cement used, per cent.	Average interval of designed joints, feet	Vialog index of roughness, inches per mile	Type of equipment used		District
							Mixer	Finisher	
CONCRETE PAVEMENT									
B. T. Millard	J. E. Kinyon	319.0	164.5	2.86	20	9.5	Foote 27E	1 Ord Finisher	III
M. C. Fosgate	R. A. Westbrook	498.0	216.1	1.48	20	8.4	Foote 27E	1 Ord Finisher	IV
T. W. Voss	J. E. Burke	371.5	240.1	0.88	20	11.0	Foote 27E	2 Ord Finisher	V
T. W. Voss	J. E. Burke	424.0	145.8	1.65	20	9.0	Smith 21E	1 Ord Finisher	V
J. B. Hodges	C. J. McCulloch	457.5	215.8	1.27	20	6.7	Koehring 27E	1 Ord Finisher	VII
W. I. Templeton	W. I. Templeton	*414.0	63.8	2.51	20	14.5	Foote 14E	1 Lakewood Tamper	VII
J. B. Hodges	R. D. Kinsey	492.0	106.9	1.14	40	8.2	Rex 21E	1 Lakewood Tamper	VII
L. R. McNeely	L. R. McNeely		219.1	1.17	20	17.7	Rex 21E	1 Lakewood Tamper	VII
W. I. Templeton	O. T. Walkey	*435.0	114.6	1.85	20	13.3	Rex 21E	1 Ord Finisher	VII
R. C. Payne	L. R. McNeely	395.5	204.0	1.08	20	11.0	Rex 27E	1 Lakewood Tamper	VIII
C. M. Butts	F. M. Parrish	457.5	247.2	0.64	20	8.5	Foote 27E	2 Ord Finisher	X
C. M. Butts	V. G. Horton	432.0	232.9	0.18	20	6.0	Foote 27E	2 Ord Finisher	X

CONCRETE SHOULDERS

M. C. Fosgate	R. A. Westbrook	389.5	196.2	1.11	20	8.6	Koehring 27E	1 Ord Finisher	IV
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CRETE PAVEMENT

Resident Engineer	Street Assistant	Type of finish by miles		Average tonnage laid per day	Average relative specific gravity in per cent.	Vialog index of roughness, inches per mile		Type of equipment used		District
		Hand	Machine			Hand finish	Machine finish	Mixer	Finisher	
Clyde Rust	E. J. Peterson	0.68	1.20	357.6	96.5	34.2	20.3	Geiger Plant	Ord Finisher	III
H. A. Simond	E. J. Brown	0.76		234.0	96.0	43.3		Geiger Plant	Hand Rake	IV
M. C. Fosgate	R. A. Westbrook	0.62	3.41	250.6	97.4	34.5	18.7	Geiger Plant	Ord Finisher	IV
E. E. Sorenson	H. M. Chapman	1.30		327.4	95.0	23.8		Geiger Plant	Hand Rake	IV
H. B. La Forge	J. A. Whyte									
	R. Becker		6.09	368.6	95.7		10.5	Geiger Plant	Ord Finisher	VI
P. L. Wilcox	W. B. Reed		6.46	355.1	94.5		10.8	Madsen Plant	Ord Finisher	VI
J. F. Knapp	J. W. Greeley	0.70		260.4	95.0	21.6		Geiger Plant	Hand Rake	VI
W. D. Eaton	L. R. McNeely		3.46	574.3	96.0		8.7	Union Tank Co. Plant	Ord Finisher	VII
J. M. Lackey	J. M. Lackey	2.26		446.0	95.9	34.1		Madsen Plant	Hand Rake	VIII
H. O. Ragan	J. M. Hollister		9.29	562.7	96.6		18.3	Madsen Plant	Ord Finisher	VIII
H. O. Ragan	J. M. Hollister	1.00		321.5	94.7	25.7		Madsen Plant	Hand Rake	VIII
	T. B. Landers									
J. M. Hollister	E. A. Bannister		7.23	355.3	98.0		17.0	Madsen Plant	Ord Finisher	VIII
J. W. Cole	L. E. Ford	0.20		110.7	94.8	29.5		Geiger Plant	Hand Rake	X

crete being produced, and for the coming season propose to have a representative present at the start of each project to cooperate with the resident engineer and make an initial series of casts which will be used as a comparison with the casts made during the progress of the work.

ASPHALTIC CONCRETE

Mix—The design of mix remains the same as used in 1927 using the comparatively high rust content on the surface course. A stability testing machine for the mortar content of mixtures has been adopted by the laboratory and used on the past season's work. As soon as plant mixtures are started, a sample of the mix screened through the 10-mesh is submitted to the laboratory as a check upon the field design. The specimens are molded into cylinders and subjected to pressure at 140 degrees Fahrenheit until they flow through an orifice slightly smaller in diameter than the cylinder. The ultimate load at which they flow is considered a measure of the stability or related to the resistance to displacement under traffic with extreme temperature. Eastern investigations have

led to the conclusion that 2000 pounds is sufficient to insure stability of surface mixtures. The last season's work varied between 2000 and 10,000 pounds. At the present time, the laboratory is investigating a machine to determine the shear strength of specimens fabricated from the entire mix.

Design—With the exception of one project, all widening of existing pavement last season, as well as the surfacing, was constructed with asphaltic mixture. For reasons of economical construction where conditions are at all favorable for black base, the mixed type of Portland cement concrete and asphaltic concrete construction is being avoided. Thirty-six per cent of last season's asphalt work was constructed of the black base type.

Where black base is used the typical cross section is very similar to that of Portland cement concrete construction, both edges being thickened. This design was first attempted on our construction across the Sand Hills near Yuma in 1926 and has since been adopted as standard.

Construction—Prior to the perfecting of mechanical means of spreading asphalt mixtures, the output of a

Yearly Comparisons by Districts

District	Miles constructed					Average compressive strength, pounds per square inch, 28-day age					Average roughness, inches per mile				
	1924	1925	1926	1927	1928	1924	1925	1926	1927	1928	1924	1925	1926	1927	1928

PORTLAND CEMENT CONCRETE PAVEMENT

I		6.6				4,980					11.7				
II	9.9	1.5				4,055					29.7				
III		0.6		0.4	1.1	3,425			3.810	3,190	43.0			5.6	9.5
IV	4.3	7.7	7.2	10.5	4.6	3,230	5,110	4,915	4,845	4,980	15.4	29.5	5.7	8.5	8.4
V				5.9	10.0				4,790	3,810				5.1	10.6
VI		5.0				4,070					11.7				
VII	33.9	8.6	44.6	37.2	2.0	3,295	3,690	4,145	4,410	4,735	20.8	10.0	6.8	8.1	9.6
VIII		12.5	3.0		4.8		3,945	3,800		3,955		10.0	15.4		11.0
IX															
X	13.0	9.0	0.5		11.1	2,680	4,490	3,960		4,485	15.9	10.5	6.5		7.5
State						3,150	4,311	4,214	4,510	4,235	19.2	14.3	7.1	7.8	9.3

PORTLAND CEMENT CONCRETE SHOULDERS

I															
II															
III															
IV	4.3	4.4	0.3		3.4	3,310	4,202	3,920			27.9	9.4			8.6
V		5.3	1.6				3,580	3,615		3,895	17.9	3.5			
VI		5.9	2.1	10.0			3,370	3,254	3,465						
VII			15.1					3,833							
VIII			28.7	9.0				3,965	3,470						
IX															
X	4.0	12.8	7.8			4,200	3,550	4,099			33.9				
State						3,751	3,691	3,867	3,495	3,895	28.9	4.4			8.6

ASPHALTIC CONCRETE PAVEMENT

District	Miles constructed					Average roughness, inches per mile									
	1924	1925	1926	1927		1928		1924	1925	1926	1927		1928		
				Hand	Machine	Hand	Machine				Hand	Machine	Hand	Machine	
I															
II															
III			1.8	1.1	3.1	0.7	1.2		90.6	21.4	25.0		34.2	20.3	
IV	7.4	1.9	0.7	2.5		2.7	3.4	23.2	24.7	62.0	35.2		31.3	18.7	
V		1.6	7.3						27.2	24.2					
VI		8.4	4.5	10.1	12.2	0.7	12.6		18.9	19.2	19.9	14.6	21.6	10.7	
VII				1.0		2.3	3.5	17.3			17.6		34.1	8.7	
VIII	2.8			9.0		1.0	16.5			23.3	30.8		25.7	17.7	
IX			21.3												
X	16.4	2.6	12.8			0.2		32.3	50.4	25.4			29.5		
State								30.1	33.2	24.1	25.2	14.6	30.9	14.7	

plant was limited by the speed with which the mix could be handled on the street and there was no incentive to increase the capacity of mixing plants. Now that the machine has trebled the capacity of former hand methods of spreading, plants have been increased in size until double the former average daily output was secured on some projects last season and even larger plants are being constructed for the present season's work.

Depth of surface course has been thickened to two inches through last season's work in place of one and one-half inch as of former practice.

Size of surface finish screenings was increased to passing three-quarter inch and retained on one-quarter inch on one project last season by substituting a three-quarter inch plant screen for the one-half inch formerly used. This size of rock gave a non-skid surface finish superior to anything yet attempted and

for the present season's work these screen sizes are to be used throughout.

Results of Tests—Daily samples of the compressed and uncompacted mixture are submitted to the laboratory for determination of relative specific gravity and analysis of the mixture. Average relative specific gravities of surface course on the projects varied from 94.5 per cent to 98 per cent representing voidages of from 2 to 5½ per cent.

In addition to the above tests a measure of the stability is taken during the earlier part of the work and when the design of mix is changed.

SURFACE ROUGHNESS

Roughness of last season's work was determined by the Roughometer device. Several other devices were experimented with during the past season and further work along this line is contemplated.

New State Toll Bridge Policy Inaugurated by Governor Young

ON Monday, June 10th, Governor C. C. Young inaugurated a new toll bridge policy in California by signing four measures, known in the Legislature as the toll bridge bills. Governor Young established the policy in California of public ownership of all toll bridges in the state with the end in view

of ultimately eliminating all toll charges on bridges along the highways of California.

The four measures signed by Governor Young provide a method whereby the state can finance, by means of revenue bonds, the construction or purchase of bridges which

cost can not be defrayed from current state highway or county road funds.

The measures signed by Governor Young provide:

(1) A body designated as California Toll Bridge Authority is established, and this body and the Department of Public Works are authorized by Senate Bill 700 to build, buy, or condemn toll bridges, through the medium of revenue bonds, such bonds not to constitute debts or liabilities of the state, but to be entirely retired by tolls for passage over these bridges;

(2) The authority to issue franchises for future toll roads and toll bridges is transferred by Senate Bill 701 from boards of supervisors to the State Department of Public Works;

(3) The archaic Toll Bridge Act of 1881 is repealed by Senate Bill 702. Under the act of 1881 the State Engineer was required to pass solely on draws and spans in a perfunctory fashion, but was vested with no real authority to pass on the general financial and engineering feasibility of toll bridges;

(4) The California Toll Bridge Authority and the State Department of Public Works are authorized by Senate Bill 538 to lay out, acquire and construct a bill from San Francisco to Alameda County, the cost of which must be borne by the issuance of revenue bonds, or by voluntary contributions of cities, counties, or the city and county of San Francisco.

The California Toll Bridge Authority created by Senate Bill 700 is composed of the Governor, Lieutenant Governor, Director of the Department of Finance, and the Chairman of the California Highway Commission. The Department of Public Works must submit its recommendation and estimate of costs as the acquisition or construction of toll bridges to the California Toll Bridge Authority. This latter body is vested with authority to authorize or to refuse to authorize the issuance of revenue bonds for the purchase or the construction of these bridges. These bonds do not constitute a debt or general obligation upon the state, but are to be retired solely from the earnings of the structure against which they are issued. The law provides that they shall not bear a greater interest than 6 per cent and can not be sold for less than par and accrued interest.

Particular interest attaches to the use of revenue bonds in the purchase or the construction of these structures, inasmuch as it is the first time that this form of financing has been used by the State of California. It has been used, however, successfully in a number of other states, notably New York, Indiana, Kentucky, Ohio, and in many municipalities throughout the nation. It is an old established method of financing in Europe.

The bills constitute some of the most important legislation enacted during this session that has just closed. They were introduced into the Legislature by Senator Fellom of San Francisco. They were drawn with extreme care, Frank English representing Attorney General Webb, C. C. Carleton, representing the Department of Public Works, John J. O'Toole, City Attorney of San Francisco and John Dailey his assistant, representing the city and county of San Francisco, participated in the work of drafting them. Judge Matt I.



C. C. YOUNG, Governor.

Sullivan, former Chief Justice of California also advised in the legislation.

The introduction of the bills followed an intensive study of the toll bridge situation in California made by C. H. Purcell, State Highway Engineer, and C. E. Andrews, Bridge Engineer, Division of Highways, Department of Public Works. This study disclosed that the cost and operation of privately owned toll bridges in California is excessive; that tolls being charged are far in excess of the amount necessary to operate and amortize the cost of similar state built and operated structures; that the rates of tolls on the Carquinez and Antioch bridges indicate that the cost of public service on those bridges is at least 88 per cent higher than it would have been on similar bridges constructed and operated by the state; that the expense of promotion and organization of a privately owned toll bridge is in many cases a major item in its cost; and that the cost of financing privately owned toll bridges is excessive.

The signature to the four toll bridge bills marks the third major contribution of Governor Young to the highway system of California. The first contribution was his signature to the one-cent gasoline tax by which state highway construction was renewed in California. Second, was his insistence that all roads proposed for inclusion in the state highway system should be first subjected to study, survey, and analysis by the Department of Public Works before their inclusion in the state road system. Ranking with these is his action today in terminating the toll bridge abuse in California.

Governor Young issued the following statement in connection with signing the toll bridge bills:

"The state has spent upwards of \$150,000,000 in the construction of our state highway system. It is spending from \$25,000,000 to \$30,000,000 a year in the maintenance and extension of that system.

"If the state itself is willing to undertake the building of bridges, where toll bridges are necessary, there is no sound reason why private bridge promoters should be permitted to clutter up our highway system with privately owned toll bridges.

"The improvement and extension of the highway system will bring increased traffic over bridges. The state itself should be in a position to take advantage of this increased traffic and retire the outstanding bonds, and thereby hasten the time when all toll charges can be eliminated and the particular bridge be thereafter operated as a free public bridge.

GOVERNOR—DEPARTMENT ARE COMMENDED FOR SAFER STATE ROADS

R. E. PFAEFFLE, State Publicity Chairman in the
T. P. A. (Travelers) Magazine.

It is noted with interest that the State of California is out to improve highway safety, for in his 1929 message to the State Legislature, Governor C. C. Young states: "Increased attention is being given to make the highways of this state safer for travel. This is being accomplished through the elimination of dangerous curves; the separation of railroad grade crossings; striping the highways and thus providing defined travel ways; the abatement of the dust danger on such roads through oiling; betterment in alignment; more adequate protective signing; reduction in the crown of roads; increase in road widths; more guard rails; etc." The T. P. A. is ever interested in public welfare, and we congratulate Governor Young and the Public Works and Highway Departments.

"If the state should construct a toll bridge it will be so located as to best fit into the existing and contemplated highway system. The entrance of the state as a principal should also hasten the construction of a bridge across San Francisco Bay.

"Under these bills the state can purchase existing toll bridges when it appears advisable to do so. The state is also empowered to take under eminent domain proceedings where the parties can not agree on a price.

"The holders of stock in privately owned bridge corporations have no cause for alarm because of passage of this bill. Their interests will be much better served, probably, if the state buys the particular bridge and pays full value therefor than will be the case in many instances where competitive bridges may be built. The history of privately owned toll bridges in this state is yet new, but instances can be pointed out where the stockholders interest in certain bridges are already vitally effected by the later promotion and building of other toll bridges. Those who may purchase the revenue bonds for the acquisition or construction of a state owned toll bridge will be much better protected in their investments than are the stockholders in the companies now owning and operating toll bridges in this state."

MISSOURI—Employees of the Missouri state highway department have been issued badges for identification to be worn while they are working. The badge, elliptical in shape, carries the number of the employee and the words "Courtesy—Free Service." The purpose of the words is so that tourists may feel free to ask for information.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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B. B. MEEK.....Director
GEORGE C. MANSFIELD.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

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DIVISION OF HIGHWAYS DEPARTMENT OF PUBLIC WORKS STATE OF CALIFORNIA

C. C. YOUNG, Governor

B. B. MEEK, Director, Department of Public Works
CORNING DE SAULES, Deputy Director, Department of Public Works

C. C. CARLETON, Chief of Division of Contracts and Rights of Way

GEORGE C. MANSFIELD, Editor, California Highways and Public Works

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C. S. POPE, Construction Engineer

T. H. DENNIS, Maintenance Engineer

CHAS. E. ANDREW, Bridge Engineer

R. H. STALNAKER, Equipment Engineer

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DISTRICT ENGINEERS

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E. Q. SULLIVAN, District VIII, San Bernardino

F. G. SOMNER, District IX, Bishop

R. E. PIERCE, District X, Sacramento

General Headquarters, Third Floor, Highway Building,
Eleventh and P Streets, Sacramento, California

Remembering State By Camps it Keeps

James R. Griffith, Assistant Professor of Civil Engineering at the Armour Institute of Technology, Chicago, has an article in the June issue of *The Highway Magazine* entitled, "A community is remembered by the camp... it keeps." In this article Professor Griffith given opinions of forty-one automobile camps where he stayed while on an 8000-mile trip from Chicago to the southwest, up the Pacific coast, through the northwest and back to Chicago. He describes a California camp as "Unquestionably the camp we found having the most convenient facilities" and under a large photographic reproduction of another California camp is the caption, "Will last year's tourist again stop at your city, or motor through your state or county? Such neat, comfortable roadside camps as this one invite tourist business." Unfortunately, Professor Griffith encountered many insanitary camps in other states. He concludes his article with the significant statement, "The poor camps are always complaining that they are unable to supply conveniences due to their lack of trade. The good camps are usually full. I believe that when municipal and highway authorities appreciate the impression fixed by the auto camp, they will take pains to control them. Possibly state laws controlling the wayside camp would still better conditions."

California automobile camps are inspected regularly by the Sanitary Inspection Division of the State Department of Public Health, and the regulations for their sanitation, promulgated by the State Board of Public Health, are enforced rigidly.

SPECIAL TRUCKS

BUILT BY STATE

TO FIGHT FIRES

Specially designed and equipped fire-fighting trucks are being constructed in the Sacramento shops of the State Highway Division for use in southern, central and northern California.

Four two-ton trucks, geared to travel at a speed of 40 miles an hour, with 200 gallons of water, 2000 feet of hose, camping outfits, tools for 20 men and other equipment, will be ready July 1.

One of the trucks will serve Riverside, San Bernardino and Orange counties; a second is for Tulare and Fresno counties; a third for Butte, Placer, Yuba and Nevada counties, and the fourth for Lassen, Shasta and Trinity counties.

There was a sign, "Fine for parking automobiles." That's fine thought the farmer, so he parked in a fine place.

New Herndon Bridge is Dedicated

WE dedicate today this structure of cement and steel which we call the Herndon Bridge. But this bridge is not constructed of cement and steel alone. A thought, an idea first spanned this stream. There was Man Thinking. And then came Man Working and poured into this mould of thought the cement and wrought into it the steel, and out of the invisible created the visible thing upon which our eyes now rest. And as we look, we say it has strength, durability, utility and beauty. But we know it would not be here had there not been a thought, Man Thinking. And we know that the thought would have had no fruition had it not been for Man Working!

"So we dedicate this bridge to Man Thinking and to Man Working, to these two who are ever combining and cooperating to build bridges and market places and schools and temples, and who, together, constitute that strong, durable, useful, beautiful and immaterial thing, the State."

With these words Senator M. B. Harris of Fresno, member of the California Highway Commission, dedicated the new Herndon Bridge over the San Joaquin River, on Thursday, June 6th.

The dedication ceremonies attracted a large throng to the bridge. In addition to Senator Harris, brief addresses were made by Ralph W. Bull, chairman, and Fred S. Moody, member of the California Highway Commission; B. B. Meek, director of the Department of Public Works, and E. E. Wallace, district engineer. Other speakers were Chester H. Warlow, president of the Fresno County Chamber of Commerce; N. Barsotti, president of the Madera County Chamber of Commerce; W. A. Collins, chairman of the Fresno County Board of Supervisors and C. A. Clark, chairman of the Madera County Board of Supervisors.

The bridge was christened by crashing two bottles of San Joaquin River water tied to the opposite ends of a ribbon barrier placed across the bridge on the boundary line between Fresno and Madera counties. Little Joan Lake of Fresno and petite Helen Hosler of Madera severed the ribbon which fell in two sections into the river, thus officially opening the bridge to travel. As the charming little girls performed the ceremony of christening the bridge, chairmen Collins and Clark of the

Fresno and Madera County boards of supervisors, and Messrs. Warlow and Barsotti of the chambers of commerce of the two counties, grasped hands along the line dividing the bridge.

The new Herndon Bridge replaces a frame structure erected in 1884 and soon to be demolished as dangerous to heavy traffic. The contract for the bridge was awarded on April 18, 1929, to Carl H. Peterson of Fresno. The cost of the structure was \$196,051. In addition to providing a proper crossing over the San Joaquin River, the bridge eliminates two railroad crossings.

The bridge consists of four 162-foot deck steel truss spans, two 83-foot deck girder spans, and one 66-foot deck girder span supported by concrete piers, which in turn rest upon a pile foundation. The deck and curbs and end posts are constructed of reinforced concrete. The structure provides a 30-foot clear width of roadway. The truss being designed so that an additional 10-foot width of roadway may be added when traffic requires it. Special features of the structure are ornamental railings, the lighting arrangements, and pedestrians' retreat at each end. The railing is constructed of iron and cast steel and will be used again when the traffic bridge is widened.

The bridge was designed in the Bridge Department of the Division of Highways.

DESERT LOCATING ENGINEER DIES

(From the Redlands *Facts*, April 15.)

Stricken on Friday night with a sinus infection, Howard (Steve) Noble, a location engineer for the State Highway Department in San Bernardino County for many years, died yesterday morning in the Riverside Community Hospital.

Noble's headquarters were in San Bernardino but he had lived for the past several years in various desert towns while road construction was in progress. He had for the past several months been living in Blythe.

Noble was one of the oldest employees of the State Highway Department, having been associated with the department for the past 10 years. He was considered one of the best desert locaters in the employ of the state. During his service in the county he had lived in Victorville, Barstow and Ludlow.

PENNSYLVANIA—State highway patrolmen in 1928 examined 261,027 people applying for licenses to drive motor vehicles, of which 62,142, or 24 per cent, failed to qualify as safe drivers.

Scenes at Herndon Dedication



Highway Commissioner Moody, Director Meek and Highway Commissioner Harris, speaking at the Herndon Bridge dedication. Scene on the bridge; Joan Lake and Helen Hosler cutting the ribbon that formally opened the bridge.

1929 State Highway Oiling Program

Methods Used; List of Projects

OVER ONE THOUSAND earloads of asphaltic road oil will be spread on the state highways by the maintenance department organization during the 1929 season. The work to be done is of three types; dust laying, oil surface treatment and "armor coat" wearing surface. The present plans provide for dust laying application on 1000 miles, oil surface treatment of 160 miles and "armor coat" on 300 miles of highway. This work is in addition to the oiling by contractors in connection with surfacing construction projects.

The use of light asphaltic fuel oil to lay the dust on the unsurfaced earth roads and on traffic-bound rock surfaces wherever volume of traffic justifies the expenditure has added to the comfort, convenience and safety of traffic, and has been of direct benefit to residents and owners of orchards, vineyards and other crops adjacent to the highway through reducing the dust which formerly blew over them with the passing of each vehicle. Two applications of the oil, at the rate of one-quarter gallon for each square yard of surface, are generally required each season. The spreading of dust layer oil does not interfere with traffic as it is quickly absorbed into the road surface.

The oil surface treatment of rock-surfaced roads will be of either penetration or oil mix type, depending on whether the metaled surface is bound or loose. Oil containing a higher percentage of asphalt than the dust layer is used for this work.

The penetration type of work is constructed in two applications of oil and screenings on the bound rock surface after dust and loose material have been swept off. The compacting and sealing of the surface is accomplished by traffic. The mix type of surface is constructed by mixing the oil with the top layer of rock or disintegrated granite by means of harrows and graders. The compacting of the oiled material is then left to traffic with the assistance of a drag which is operated to keep the surface smooth.

Particular care is taken to protect traffic by doing the work one-half width at a time where detours are not available and by establishing one-way controls.

The "armor coat" wearing surface will be placed on sections where the road surface is well bound, either by traffic or previous oil surface treatment, and has been proven stable under traffic. On traffic-bound roads a penetration coat of light oil is applied before placing the heavier oil. The "armor coat" is a thin wearing surface made up of two applications of heavy asphaltic road oil and screenings. Each application of oil is screened and then rolled. This treatment is another stage in the development of our road, and, while it is considered in the nature of a temporary surface, experience indicates that excellent service may be expected where the base has been stabilized. Where base failures develop later repairs may be made with the minimum loss.

The work will be conducted in a manner to insure the least possible inconvenience to traffic.

The location and type of work planned for the various state routes is as follows:

Redwood Highway—Sausalito to State Line.

Between Cloverdale and Ukiah 16 miles of armor coat work will be under way starting about June 15th. The spreading of light fuel oil on the portions of this section recently reinforced with rock is already under way.

Between Forsythe Creek and the northerly county line in Mendocino County 27 miles of "armor coat" will be placed on various sections. This work will start about May 20th. From Laytonville north 1.3 miles of oil mix type surface is to be constructed.

In Humboldt County some 34 miles will be surfaced with "armor coat" on scattered sections. Most of these sections have been recently reinforced with rock. In addition to the "armor coat," dust layer oil will be spread on about 28 miles of road. Part of this dust layer is to carry over sections not ready for "armor coat" and the balance is for sections to be paved late this season.

In Del Norte County dust layer oil is to be placed on the 28-mile section between the southerly county line and Crescent City as a penetration course, and "armor coat" wearing surface is to be placed on this entire section. The 3.8 miles from Crescent City to Elk Valley road is to be armor coated and dust layer spread on the four miles from Elk Valley to Smith River. This latter section is to be paved with bituminous macadam later in the season. From Smith River to the State line some 13 miles of "armor coat" work is now under contract and it is proposed to produce screenings this season so the balance of this section of road can be armor coated next year.

Roosevelt Highway—Crescent City to State Line.

The entire length of this route, 22.5 miles, is to receive an armor coat wearing surface.

Weaverville Lateral—Arcata to Redding.

4.5 miles east from Arcata is to receive an armor coat surface.

McDonalds to the Sea Highway.

38 miles of the section from McDonalds to the Navarro River is to be treated with dust layer oil starting about May 20.

Tahoe-Ukiah Highway.

9 miles of the section between Ukiah and Upper Lake is to be armor coated, starting about June 1.

Between Venado and Hamilton Junction 3 miles of dust layer oil is to be spread.

East of Marysville between Seven-mile House and Rough and Ready dust layer oil will be placed on 27 miles, starting about July 1.

Hopland to Lakeport.

9 miles of this route is to be armor coated.

Beltane to Schellville.

4 miles of this route in Sonoma County is to be armor coated, starting about July 5th.

Alto to Belvedere.

4 miles of resurfacing is planned for this route.

Calistoga to Route 15 near Clear Lake.

In Lake County from county line to Middletown, 6 miles, is to be armor coated. Work is already under way.

From Middletown to junction with the Tahoe-Ukiah route, 23 miles is to be treated with dust layer oil.

Pacific Highway—La Moine to State Line.

The section, 18.8 miles long, in Shasta County from La Moine to Siskiyou County line which was graded last year and surfacing recently completed is to be treated with an armor coat. Work will be under way about May 13th.

From Gazelle to Yreka dust layer oil is to be spread on 18 miles starting about June 10th. Armor coat is to be placed later.

From Shasta River to State line 15 miles of armor coat is to be placed.

Alturas Lateral—Redding to Nevada State Line.

From Redding to Diddy Hill 22 miles of dust layer oil is to be spread, starting about June 1.

From Montgomery Creek to Haines Ranch 17 miles of armor coat wearing surface is to be placed, starting about June 12th.

From Hillside to Bieber in Lassen County 4 miles of oil mix surface is to be renewed and plans are under way for armor coat treatment, from Alturas 12 miles east when this section can be undertaken.

Susanville Lateral—Red Bluff to Nevada State Line.

Dust layer oil is to be spread on this route from 7 miles west of Paynes Creek to Paynes Creek and from Mineral to Mill Creek in Tehama County. In Lassen and Sierra counties from Doyle to 2 miles west of Milford and from Long Valley Creek to State line. This application will cover 60 miles of highway.

Armor coat wearing surface is proposed for the greater part of route 29 as soon as the rock surfacing is in condition to receive it. Plans are under way for production of rock and screenings for work from Paynes Creek to 8 miles east and Battle Creek to Mineral in Tehama County; from Coppervale to Devils Corral in Plumas County; from Susanville to 7 miles east and Johnston to Milford in Lassen County. These plans cover a distance of 54 miles, but base conditions will not permit oiling the entire distance this season.

Oroville to Quincy (via Bucks Ranch).

Dust layer oil is to be spread from Miner's Ranch to the easterly county line, a distance of 30 miles, all in Butte County.

Downieville Lateral—Nevada City to Downieville.

Dust layer oil is to be applied on this entire route, a distance of 46 miles.

Auburn to Truckee.

Armor coat surface is to be applied from Colfax to Gold Run and from Soda Springs to Donner Lake, a distance of 15 miles.

Dust layer is to be applied from Indian Springs to Soda Springs, a distance of 10 miles. This oil will be applied about June 1.

Mother Lode Highway—Auburn to Sonora.

Dust layer oil is to be applied from Auburn to Placerville, a distance of 26 miles; from El Dorado to Plymouth and Jackson to Mokelumne River in Amador County; from County line to San Andreas, Willow Creek to Altaville and Angels Camp to County

line, in Calaveras County, and from County line to Sonora in Tuolumne County, a total of 56 miles.

Placerville to State Line.

Dust layer oil is to be applied from Riverton to State line, a distance of 40 miles.

Myers to Nevada State Line via Truckee.

Dust layer oil is to be applied for 12 miles from Myers to Cascade Lake.

Armor coat is to be placed from Emerald Bay to Meeks Bay, 5 miles, and 15 miles of oil mix work is now under way between Tahoe City and Truckee. Oil mix surface will be placed through Truckee, one mile, and armor coat constructed from Truckee to State line, 19 miles, when the base is reinforced.

County Line to Central House in Amador County.

9 miles of road is to be retreated with fuel oil and remixed this season.

Arno to Picketts Junction via Jackson.

Dust layer oil is to be applied from Cooks Station to Tragedy Springs for a distance of 28 miles.

Between Pioneer and Chapmans the base is to be reinforced and light penetration oil coat applied.

Portions of the 8-mile section east of Clay in Sacramento County are to be retreated, and 4 miles of dust layer spread west of Clay.

Lodi to Silver Creek via Angels Camp and Ebbetts Pass.

A one-mile section east of Victor is to be retreated with armor type of surface.

Screenings will be stockpiled for armor coat between Murphys and Big Trees, a distance of 15.5 miles, and dust layer oil will be spread over this section, also for 11 miles from Big Trees to Black Springs.

Salida to Sonora Junction via Sonora Pass.

The surface between Pooleys and Long Barn is being reinforced. Screenings for armor coat will be produced and dust layer oil applied on this 12-mile section.

Dust layer oil will also be applied from Sonora to Pooleys and from Long Barn to top of Strawberry Grade for a distance of 22 miles.

Junction Route 13 to Yosemite Park via Groveland.

A one-mile section from Mountain House to Chinese will be leveled and retreated with armor coat type of surface.

Dust layer oil will be applied on some 40 miles of this route.

Skyline Boulevard—San Francisco to Saratoga Gap.

A 5-mile section in San Mateo County north of La Honda is to be treated with armor coat type surface. This work has already started. The 14-mile section north of Saratoga Gap now under construction will be treated with dust layer as a part of the work.

Bayshore Highway—San Francisco to San Mateo.

Portions of the 8-mile section south of the Underpass will be retreated with heavy oil as required.

Boulder Creek to Redwood Park.

6 miles of this road will be improved with an armor coat surface. Work will start about May 20.

Saratoga Gap Through Redwood Park.

Dust layer will be applied on 20 miles of this road.

Gilroy Through Pacheco Pass.

Armor coat surface will be applied on 9 miles of this route. This is in addition to 16 miles of bituminous macadam which is provided in the Construction budget.

All-Year Highway—Merced to Yosemite.

6 miles of road now under construction between the County line and Cathay, will be oil mixed. Between Mariposa and El Portal 5 miles of regraded road will be oil mixed.

Dust layer oil will be spread on 24 miles of unrolled section in Mariposa County.

San Lucas to Sequoia National Park.

Oil mix surface will be placed on the 15-mile section from Parkfield Junction to Monterey County line.

Junction Valley Highway near Bakersfield to Paso Robles.

Dust layer oil is to be applied from the west County line in Kern County east for 12 miles.

Santa Maria to Freeman via Walker Pass.

5 miles of armor coat surface is to be retreated in Santa Barbara County. This work will start about July 15.

Dust layer oil is to be applied on 10 miles east of Maricopa.

Carmel to Cambria.

Dust layer oil is to be applied on 15 miles from 2 miles north of Cambria to 6 miles north of San Simeon in San Luis Obispo County.

South of Carmel 5.5 miles of armor coat surface is to be placed.

San Diego to El Centro.

From Kitchen Creek to Pine Valley portions totaling 16 miles in length have been programmed for oil mix surface. These are sections for which funds are not available for paving during the next biennium.

Crest Route—San Bernardino to Bear Lake.

Funds have been provided for oil mixing newly graded sections and for retreatment of old oil surface on some 20 miles of this route between Waterman Canyon and Bear Lake. Work is now under way.

Arrowhead Trail—San Bernardino to Jean.

Dust layer oil is being applied on this route for 80 miles westerly from the State line. This will provide an oiled surface from Daggett to the State line.

El Centro to Yuma.

A 7-mile section of the oiled roadway east of Holtville is to be remixed.

Pasadena to Switzers Relay.

Dust layer oil is to be applied to this 4-mile section.

Mojave to Coleville.

10 miles of this road between Big Pine and Bishop and in Round Valley is to be oil mixed.

Dust layer oil is to be applied on 22 miles of this route in Inyo County and on 42 miles in Mono County.

CALIFORNIA SECOND AMONG STATES IN AUTO OWNERSHIP

The total registration of motor vehicles in the United States during 1928 was 24,493,124, a gain of 1,359,883, or 5.9 per cent over the number registered in 1927. The figures include passenger automobiles, taxis, busses, motor trucks and road tractors. In addition 148,169 trailers and 117,946 motorcycles were registered.

New York heads the list for 1928 with 2,083,942 vehicles registered; California is second with 1,799,890; Ohio is third with 1,649,699; Pennsylvania is fourth with 1,042,207; Illinois is fifth with 1,504,359; Michigan sixth with 1,249,221; Texas seventh with 1,214,297; Indiana eighth was 823,806; New Jersey ninth with 758,430; and Wisconsin tenth with 742,135.

In percentage gain, Arizona ranks first with 16 per cent. The District of Columbia is second with 13 per cent. Mississippi and South Dakota each report a gain of 12 per cent; New Mexico, Alabama and Connecticut report 10 per cent; Tennessee and Texas report 9 per cent; and South Carolina, Vermont, Wyoming, North Dakota, Michigan and Delaware report 8 per cent.

Comparison of the registration total with the 1928 estimated population of 120,013,000 indicates that there is now one motor vehicle for every five persons in the United States; or one for every family.

SUMMARY OF 1928 PAVEMENT CONSTRUCTION

(Continued from page 14.)

Portland Cement Concrete—Individual projects varied from 6.0 inches to 17.7 inches per mile with a state average of 9.3 inches. This represents an increase over previous averages in roughness in four of the six districts constructing this type and is an increase of 1.5 inches per mile in state average over that of 1927. This increase is due somewhat to increased number of designed joints but also represents a decided slackening up of inspection of finishing.

Asphaltic Concrete—Individual projects on machine finished work varied from 8.7 inches to 20.3 inches per mile and averaged 14.7 inches. On hand finished work, the range was from 21.6 inches to 43.3 inches averaging 30.9 inches. The general average of both types was 17.4 inches.

OUTSTANDING PROJECTS

Portland Cement Concrete—Smoothness record for the year was obtained by Resident Engineer C. M. Butts on Contract 010EC2, Fredrickson & Watson Construction Company, contractors, with an average of 6.0 inches per mile. This project likewise held the record for cement control with an average daily variation of but 0.18 of 1 per cent.

The record for average concrete strength was obtained by Resident Engineer Mr. C. Fosgate on Contract 94EC7, Hanrahan Company, contractors, averaging 4980 pounds per square inch.

The record for daily yardage produced was obtained by Fredrickson & Watson Construction Company on Contract 910EC6, C. M. Butts, Resident Engineer, with an average of 247.2 cubic yards.

Asphaltic Concrete—Smoothness record was secured by Resident Engineer W. D. Eaton on Contract 97FC5, Gibbons & Reed, contractors, with an average of 8.7 inches per mile. The best hand finished job for the season was secured by Resident Engineer J. F. Knapp on Contract 06EC3, California Construction Company, contractors, with an average of 21.6 inches per mile.

The record for density of pavement surface was obtained by Resident Engineer J. M. Hollister on Contract 98FC4, Jahn & Bressi contractors, with an average of 98 per cent relative specific gravity.

The record for production was obtained by Gibbons & Reed, contractors, on Contract 97FC5, W. D. Eaton, Resident Engineer, with a daily average production of 574.3 tons.

With respect to pavement qualities, it is felt that the assistant resident engineer, in charge on the street, is in a large degree responsible for the results secured and for this reason is being given recognition along with the resident engineer.

TABLES

In addition to the usual Yearly Summary, a table of Yearly Comparisons by Districts has been added. This table gives an interesting comparison of progress within the individual districts.

Son—"Our garage man's got a better radio set than ours, mama."

Mother—"What makes you think that, dear?"

Son—"He said he knew he'd get hell when he went home tonight."

Roadside Advertising Regulations

Reported on by U. S. Road Bureau

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IN A SURVEY of state laws governing commercial advertising signs along public highways made by the Bureau of Public Roads of the United States Department of Agriculture, it was found that such laws range all the way from the most general of rules and regulations to certain well-defined stipulations. Only seven states are without state regulation—South Carolina, Arkansas, Texas, New Mexico, Oklahoma, Kansas and Wyoming.

Connecticut, Massachusetts and Vermont have the best defined and most rigid laws. Before any agency can erect commercial advertising signs in these states, it must be licensed by state authorities at certain annual fees, and if it does not reside in the state a bond must be furnished. Each license must show a number and the date of expiration.

Connecticut levies a license fee of \$100 per year, and an annual permit fee of \$3 for every 300 square feet or less of advertising space to \$9 for between 600 and 900 square feet. Fees apply to each side of each panel. Signs of more than 900 square feet are not permitted.

In Massachusetts the fee is fixed with regard to administrative costs and varies throughout the state. Vermont levies an annual license fee of 3 cents for each square foot of advertising space.

In Connecticut each application for a permit must bear the written consent of the owner of the property on which the sign is to be erected. Each permit must state the size of display, and each sign must show the name of agency displaying, owning or leasing billboards. No direction or danger sign shall bear advertising.

In Vermont, the application for license shall name the property upon which advertising is to be displayed; the population of the city, village or town; the size, and description of sign and the distance at which it may be read from state highway, railroad or railway track, public park or navigable water.

State authorities of these three states—Connecticut, Massachusetts and Vermont—have the right to exact fines for nonconforming signs and to remove them. The cost of removal, after due notice has been served, is collected from the agencies or from the

sureties on bonds. Connecticut imposes a fine of \$100 for each nonconforming sign; Massachusetts, a fine of not more than \$100 with a further \$500 for continued violation; Vermont, a fine of \$100, or imprisonment of 30 days, or both.

Also in Connecticut, any person who shall deposit, throw, affix or maintain any advertisement within limits of any public highway or on private property without consent of owners is subject to a fine of not more than \$50 or imprisonment of not more than six months, or both.

Advertising signs in Connecticut may not be placed within 15 feet of the right of way of a highway, and in Massachusetts within 500 feet. In these two states, cities and towns may further regulate and restrict advertising signs in a manner not inconsistent with state laws.

Local authorities of the three states may remove nonconforming signs within their jurisdictions.

Laws of the three states, as well as laws of other states, permit certain advertising by manufacturers or landowners located along highways.

Seven other states—Florida, Georgia, Mississippi, Nebraska, Nevada, North Carolina and Tennessee—impose fees for advertising signs. Mississippi collects a fee of 75 cents for each sign of from 10 to 100 square feet of area, \$1.50 for an area of between 100 and 300 square feet, and \$2.50 for an area of more than 300 square feet.

North Carolina exacts an annual license fee based on population of cities and towns: from \$5 in cities of 5000 inhabitants to \$50 in cities more than 35,000. Also no advertising signs are placed on private property without consent of owner and no signs are placed within limits of highways on penalty of a fine of \$50 or imprisonment of not more than 30 days. Local authorities regulate advertising signs within their jurisdictions.

Tennessee forbids the erection of signs upon the right of way of any state highway, and prohibits erection of signs resembling railroad crossing symbols on any public highway or street or on private property within one-quarter mile of any public road or street.

The state requires an annual license fee for electric signs, according to population; from \$10 in cities and towns of less than 5000 inhabitants to \$50 in those of more than 50,000. It imposes an additional annual fee of \$7.50 upon agencies posting bills or other printed matter in counties of less than 20,000 inhabitants to \$75 in counties with 60,000 or more.

In Florida, the state road department prohibits advertising signs on state highways and imposes on agencies in the bill posting business a license tax of \$5 in cities and towns of less than 10,000 people to \$30 in cities and towns of 10,000 or more.

Nebraska requires a state permit for advertising signs, with a fee of 25 cents to \$5 for each sign, and no sign may have more than 10 square feet. Also signs may not be erected within 300 feet of intersection of crossroads, and railroad crossings, and a fine of from \$10 to \$100 is levied for violation of law. All non-licensed signs are removed by state authorities.

Georgia levies an annual tax of \$1 on each agency for each location, defined as 75 lineal feet. No advertising signs are allowed on the Dixie Highway in Bibb County. Chatham County is empowered to regulate signs within its jurisdiction.

Nevada levies an annual license fee of \$5 on advertising agencies, the license to be issued by county clerk of county in which it is to be erected. Money from licenses is apportioned to the road funds of counties. No permit is issued for billboards on any location which may measurably destroy the natural beauty of the scenery or obscure a view of the road ahead. Any agency erecting nonconforming signs is subject to a fine of \$25 to \$100 or imprisonment of from 10 to 30 days.

In nine other states—Minnesota, Colorado, Maine, Iowa, North Dakota, South Dakota, West Virginia, New Hampshire and Illinois—no advertising agency may erect or maintain upon any highway or right of way any commercial advertising sign. In eight of these states authorities have power to remove all nonconforming signs, and in seven states to exact fines of from \$5 to \$1,000 or imprisonment of from one to six months. Three of the states regulate distances from railroad crossings, road intersections and from curves at which signs may be placed ranging from 300 to 1000 feet. Minnesota and North Dakota do not permit advertising on directional signs. In South Dakota, no advertising sign outside of city limits may have more than 20 per cent of its surface in red.

The laws of 16 other states—California, Maryland, New York, Idaho, Michigan, Wash-

ington, Montana, Ohio, Oregon, Pennsylvania, Louisiana, Missouri, Rhode Island, Utah, New Jersey and Wisconsin—prohibit advertising signs on private property without consent of owners and on rights of way of highways without consent of state, city or county authorities.

The majority of these states designate the distance from railroad crossings, intersecting highways and from curves at which signs may be placed, ranging from 300 to 1000 feet, with fines of from \$10 to \$500 or imprisonment of from 10 to 60 days for violation of law. A few of the states are empowered to remove nonconforming advertising signs. In others, local authorities may regulate and remove objectionable signs in territory under their jurisdiction. Pennsylvania, Michigan and Idaho permit no advertising on directional signs. Fines collected in Missouri are credited to the state road fund for maintenance.

In six states—Alabama, Arizona, Delaware, Indiana, Kentucky and Virginia—laws governing advertising signs merely state that no person shall erect or maintain upon any highway or right of way any advertising sign without the consent of state authorities.

While Arkansas has no state regulation, authority governing advertising signs is vested in the county courts with no specific legislation. In Texas, cities of more than 5000 inhabitants have power to license, regulate, control or prohibit erection of signs or billboards as may be provided by charter or ordinance. In Oklahoma, county and township boards are charged with improvement of public highways, and have power to remove all obstructions in highways under their jurisdiction.

While Wyoming has no state regulation, the highway department claims jurisdiction over rights of way and assumes authority to refuse permission to erect advertising signs and to remove any in these areas.

In Kansas, county commissioners of each county are authorized to remove all advertising signs exceeding four feet in height within 50 yards of any railroad grade crossing, abrupt corner in the highway, or entrance to driveway off the highway, after notice has been served on owner, and the cost of removal is entered on tax rolls with a penalty of 10 per cent of the cost.

New Jersey prohibits advertising signs on the Palisades along the Hudson River; New York bars advertising signs in Adirondack Park, and Delaware prohibits them for 200 feet of either side of the right of way of any highway entering Wilmington for a distance of one mile from the city limits.

U. S. Reports on Gasoline Tax Col- lections Throughout The United States

Gasoline taxes amounting to \$305,233,842 were collected on the sale of 10,178,344,771 gallons of motor fuel in 1928 in the District of Columbia and the 46 states in which the tax was effective during the whole or a part of the year, according to figures compiled by the Bureau of Public Roads, United States Department of Agriculture.

The figures include the tax collected and the gasoline consumed in Illinois during the month of January only, owing to the fact that the law providing for the state's 2-cent tax was held invalid on February 24, 1928.

Massachusetts and New York were the only states without a gasoline tax in 1928. These two have since passed laws providing, in Massachusetts for a 2-cent tax effective January 1, 1929, and in New York for a 2-cent tax effective May 1. As the Illinois legislature has passed a new law which provides for the collection of a 3-cent tax effective August 1, that date will mark the final adoption of the tax by all states, ten years after its adoption by Oregon and Colorado, the pioneer states.

Changes in the rate of taxation were effected in four states during the year. The New Hampshire tax was increased from 3 cents to 4 cents a gallon on the first day of the year. Virginia added a half-cent on March 19, 1928, making the new rate 5 cents a gallon. The Texas rate was reduced on September 1 from 3 to 2 cents a gallon; and Mississippi raised its rate from 4 to 5 cents a gallon on December 1 last.

The average rate per gallon in 1928 was 3 cents; the highest was 5 and the lowest was 2 cents. At the close of the year the rate in effect was 5 cents in seven states, 4 cents in eleven states, $3\frac{1}{2}$ cents in one state, 3 cents in 14 states, and 2 cents in 12 states and the District of Columbia.

Comparison of the total number of vehicles registered with the total tax collected in the states in which the tax was effective throughout the year shows an average revenue of \$15.09 per vehicle.

After deduction of the costs of collection the entire net revenue was used for rural road purposes in 35 states. In the remaining 13 states and the District of Columbia a total of \$18,491,754 was devoted to other purposes. In three states a portion of the collections was used for public school purposes. The January collections in Illinois were held at the disposal of the court. In five states a portion of the revenue went to cities for the construction and repair of streets, as did the entire collection in the District of Columbia. In two states small sums were deposited in the general funds of the state; in Mississippi special taxes in addition to those collected at the regular rate were used for the construction of a road-protecting sea wall; in New Hampshire a fourth of the net collection was used for the repair of flood damage; and in one state—New Jersey—a small portion of the receipts was turned over to the State Department of Commerce and Navigation.

Of the portion of the total revenue devoted to rural road purposes, the amount used for construction and maintenance of state highways was \$211,046,591; for

RECORDS SHOW VALUE OF BACK SEAT DRIVING

The much maligned back seat driver has found a champion, according to reports of the California State Railroad Commission.

After reviewing the automobile fatalities report of 1928 the Commission finds that a motorist and a half in a car constitute one wreck and that five motorists no wreck at all. The majority of automobile accidents occur when an average of 1.5 persons occupy a machine with no back seat driver to guide, and the fewest accidents occur when a machine is well loaded, several of whom presumably are back seat drivers.

construction and maintenance of local roads the amount was \$57,380,901; and the balance of \$17,619,995 was used for payments on state and county road bonds.

The following table shows the total tax earnings and the total number of gallons taxed in the various states:

State	Total tax earning on fuel and miscellaneous receipts	Net gallons of gasoline taxed and used by motor vehicles
Alabama	\$6,614,297	162,438,774
Arizona	2,018,238	50,455,046
Arkansas	5,382,782	106,147,481
California	29,566,769	935,558,973
Colorado	3,921,224	130,707,467
Connecticut	3,511,675	173,437,589
Delaware	800,349	26,678,310
Florida	11,257,617	224,704,496
Georgia	8,245,486	206,137,161
Idaho	1,884,023	47,096,637
Illinois*	*836,826	*41,841,273
Indiana	11,177,549	372,584,968
Iowa	8,535,628	284,520,934
Kansas	5,394,841	269,742,067
Kentucky	6,743,224	134,835,629
Louisiana	3,380,931	169,046,556
Maine	3,192,384	79,011,319
Maryland	5,425,873	135,646,826
Massachusetts	—	—
Michigan	18,334,840	611,161,335
Minnesota	5,768,100	288,404,998
Mississippi	5,696,553	136,334,223
Missouri	6,948,229	347,411,433
Montana	1,683,404	56,113,461
Nebraska	3,941,164	197,058,187
Nevada	531,186	13,279,660
New Hampshire	1,884,175	47,079,932
New Jersey	8,470,336	422,346,478
New Mexico	1,852,037	36,738,005
New York	—	—
North Carolina	9,787,011	244,675,269
North Dakota	1,479,469	73,973,434
Ohio	24,885,699	829,523,293
Oklahoma	8,147,901	279,996,597
Oregon	4,008,259	144,284,704
Pennsylvania	21,998,064	733,268,795
Rhode Island	1,182,328	59,116,396
South Carolina	5,518,240	110,364,802
South Dakota	3,158,873	78,965,809
Tennessee	5,134,600	171,153,333
Texas	17,945,037	681,135,373
Utah	1,664,652	47,577,166
Vermont	1,118,832	37,311,088
Virginia	8,616,239	174,800,793
Washington	4,206,515	210,325,734
West Virginia	4,308,109	107,547,068
Wisconsin	6,856,759	342,837,969
Wyoming	954,317	31,810,563
Dist. of Columbia	1,263,148	63,157,367
Totals	305,233,842	10,178,344,771

*Only January tax receipts reported as law was found invalid by Supreme Court, February 24, 1928.

Legislature Urges More Federal Aid For Public Land Roads

Urging congressional action to meet the road-building problem across vast areas of public lands in the west, the California legislature unanimously adopted a resolution in support of federal legislation to finance highway construction across unappropriated public lands and other federal reservations. The resolution memorializes the California delegation in congress to support legislation providing appropriations which would be used to build and maintain highways across those large, nontaxable areas which are held by the federal government in western states. California is affected by this problem in that two-fifths of the area of the state still remains in possession of the federal government as unreserved or unappropriated public lands, nontaxable Indian lands or other federal reservations.

The resolution presented to the legislature last week by the motorists' organization was introduced by Senator Thomas McCormack in the senate and by Speaker of the Assembly Edgar C. Levey in the lower house. It was passed by both houses unanimously under suspension of the rules. The resolution reads:

Whereas, More than two-fifths of the area of the State of California still remains with the federal government as unreserved or unappropriated public lands, nontaxable Indian lands and other federal reservations, and

Whereas, These lands are not subject to taxation, and

Whereas, The construction and maintenance of highways through and across these areas should be an obligation of the federal government requiring no financial cooperation on the part of the state or its subdivision; therefore be it

Resolved, That the California representatives in the congress of the United States be and are hereby requested to actively support legislation which will provide for appropriations by the federal government with which to build and maintain highways through and across unappropriated or unreserved public lands and other federal reservations, and be it further

Resolved, That a copy of this resolution be sent to the President of the United States, the Vice President, the speaker of the house of representatives and to each member of the seventy-first congress from the State of California.

APPRECIATION VOICED BY LEGISLATURE FOR U. S. HIGHWAY AID

The following concurrent resolution, introduced by Assemblyman Jespersen, was passed by unanimous vote of both houses of the legislature:

WHEREAS, The United States government, in federal aid, forest road, and national park funds, during the past ten years, has contributed approximately thirty-two million dollars to the highway development of California under the direction of the United States Bureau of Public Roads; and

WHEREAS, The United States Bureau of Public Roads, through Thomas H. McDonald, director, Dr. L. I. Hewes, deputy chief engineer in charge of the eleven western states, and Captain C. H. Sweetser, district engineer in charge in California, has been uniformly helpful and courteous in its participation in highway development in California, and has contributed greatly toward establishing the fine standard of highway construction now in force in California; now, therefore be it

U. S. Money Allotted To U. S. Forest Roads

In accordance with a joint recommendation by the U. S. Forest Service, U. S. Bureau of Public Roads, and the State Division of Highways, Department of Public Works, the Secretary of Agriculture has approved the expenditure of federal funds for the following road construction program in the National Forests of California, according to announcement by S. B. Show, Chief of the California District, U. S. Forest Service, in San Francisco.

Project	County	Amount pro-grammed
Quincy-Beckwith	Plumas,	\$25,000
Yuba Pass	Sierra,	166,000
Placerville-Lake Tahoe	El Dorado,	175,000
Topaz (Coleville to Nevada state line)	Mono,	100,000
Wawona-Auberry	Madera,	25,000
San Marcos Pass	Santa Barbara,	10,000
Mt. Lassen (Mineral to Lassen Nat. Pk.)		
	Tehama,	50,000
Idyllwild (Hemet to San Jacinto Mts.)		
	Riverside,	25,000
Maintenance		20,000
Surveys*		20,000
Total		\$616,000

* The survey for the Deer Creek project is now under way, financed from this item.

Twenty-five thousand dollars additional forest highway money will be expended in Nevada for constructing an extension to the California section of the Topaz project, and \$77,000 will be expended in constructing and surfacing a section of U. S. Highway No. 50 near Glenbrook.

The State of California will cooperate in the construction of the Placerville-Lake Tahoe project to an amount equaling the federal allotment. The counties of Plumas and Santa Barbara will cooperate in the amount of \$75,000 and \$10,000, respectively, on the Quincy-Beckwith and San Marcos Pass projects. Either the state or counties will also assume the maintenance responsibilities after the projects have been improved to a satisfactory standard by the Bureau of Public Roads, which will supervise the construction work on all projects.

In addition to the above mentioned expenditure, which is for roads of primary value for public travel, about \$550,000 will be expended by the forest service for constructing and maintaining roads of principal value for protecting and administering the national forests in California.

Resolved, That the State of California through its Legislature, by concurrent resolution of the Assembly and Senate, does hereby express its appreciation of the financial aid extended to California in road building by the United States and does hereby further express its appreciation of the fine cooperation supplied by Mr. McDonald, Dr. Hewes and Captain Sweetser representing the bureau of public roads; and be it further

Resolved, That a copy of this concurrent resolution properly engrossed be sent to the President of the United States, the Secretary of Agriculture, Thomas H. McDonald, Dr. L. I. Hewes and Captain C. H. Sweetser.

Court Imposes \$100 In Fines for Littering Highways

(From the Venice Vanguard, May 30.)

Giving notice that he will impose fines upon all persons guilty of dumping bottles, rags or papers on the highways within his judicial jurisdiction, Justice of the Peace John L. Webster of Malibu township, fined Abner Beard and T. R. Hunter of Santa Monica, \$50 each, after they had entered plea of guilty to carelessness.

J. A. Stauff, foreman for the State Highway Commission on the Roosevelt Highway north of Santa Monica, was the complaining witness against the two men. A few days ago Stauff was enraged when he found that someone had dumped a load of gin bottles, old rags, papers and other litter on the right of way two miles north of Topanga Canyon. He offered a reward for information that would lead to the arrest of the offenders.

Shortly after his announcement in the press, Stauff learned that Hunter and Beard were the asserted offenders. He obtained warrants for their arrest from Justice Webster.

The state law makes the dumping of bottles and refuse a misdemeanor, with a heavy fine, and the only reason that the two defendants escaped with a \$50 fine each, was because the court was convinced that their violation was not intentional, but due to carelessness.

"We must keep the highways safe and it will be the policy of this court to impose fines, and if necessary, jail sentences, to carry out the law," said Justice Webster.

Stauff, who is in charge of the highway from Santa Monica city limits to Ventura County line, states that he is determined to keep the highway free from debris and other menaces to travel and that he will make every effort to arrest those who are guilty of violating the state laws.

NEW DISTRICT EQUIPMENT SHOPS AT SAN LUIS OBISPO

New buildings to house the district and equipment shops are now being constructed in district five at San Luis Obispo on a new site recently purchased by the state for this purpose.

The new site, containing 5.7 acres located on the Coast Highway, at the southerly city limits adjacent to the Pacific Coast Railway freight yards, one mile from the center of the city, is considered to be the most advantageous location to be found in the vicinity whereon to erect the buildings necessary for maintaining highway equipment. It is the ultimate purpose to have all district buildings including administration office, maintenance shops and storage buildings located on the same property.

The first unit of the construction under contract and under way includes a shop building and equipment storage shed, both structures being of timber frame covered with galvanized corrugated metal. Additional small buildings will complete the construction at this time.

Average Mileage More Than Double In Past Decade

Washington, D.C. The average day's run of motor tourists is now 234 miles, as compared with about 100 miles a day ten years ago, according to the National Touring Board of the American Automobile Association.

Outstanding among the reasons advanced for this decided increase in the mileage covered by motorists were the following:

1. Better highways throughout the country.
2. Improvement of the motor car from the standpoint of ease of operation, comfort, safety and stability.
3. More adequate sign-posting and marking of important highways.
4. Improved motoring facilities, including standardized services in all sections and up-to-the-minute reports on road conditions.
5. A nation-wide tendency to liberalize speed laws and the passing of the roadside justice of the peace courts.

TRAVELS 420 MILES TO REACH POINT ONLY 8 MILES AWAY

(From the Redding Courier-Free Press Weekly.)

Russell H. Stalnaker of Sacramento, equipment engineer for the State Highway Commission, was in this city Monday as he was returning from Oregon, where he had been to examine some snowplows in operation on the highways of that state.

While in Oregon, Stalnaker had to travel 420 miles by detour to go eight miles.

The first snowplows he saw at work were 80 miles east of Eugene, where they were digging away at the snow that blocks the McKenzie Pass, altitude 5300 feet. To get to see the snowplows at work on the east side of the pass, eight miles away, Stalnaker had to go by way of Portland, The Dalles and Redmond, a roundabout trip of 420 miles.

LOANS OIL TO CHICO TO SAVE FRUIT CROPS

(From the Chico Record, April 11.)

In order to save orchard crops in this region, the State Highway Commission this week placed in the hands of J. H. Priel, distributor, 4000 gallons of oil for use in smudging by orchardists. The oil was turned over for orchardists' use when the available supply in Chico and Durham became exhausted. Several cars of oil have been obtained and are available now, however, and orchardists are well supplied. More oil has been used this season than for many years, dealers report.

"Mama," said little Elsie, "I never see any pictures of angels with whiskers. Do men go to Heaven?"

"Well," said the mother, thoughtfully, "some men do go to Heaven, but they get there by a close shave."

NEW HIGHWAY LEGISLATION COVERS MANY IMPORTANT SUBJECTS

(Continued from page 1.)

TOLL BRIDGE LEGISLATION

Senate Bill No. 700, Chapter 763, Senator Fellom.

This measure authorizes the California Toll Bridge Authority and the Department of Public Works to build, buy or condemn toll bridges through the medium of revenue bonds, such bonds not to constitute debts or liabilities of the state, but to be entirely retired by tolls for passage over the bridges themselves.

It is believed that there is ample legal authority for sustaining the validity of such bonds in the State of California and that the time has arrived for the inauguration of the policy of the people financing all their own major toll bridges by the state by the use of revenue bonds, and retiring the same with the tolls in a much more economic and expeditious manner than private companies can do.

Senate Bill No. 701, Chapter 764, Senator Fellom.

This measure, in brief, transfers the authority to issue franchises for future toll roads and toll bridges from boards of supervisors to the State Department of Public Works.

It seems that the time has now come when toll roads and toll bridges, if hereafter permitted at all, should be at points which will best fit in with the state highway system of California.

Certainly the Department of Public Works is the best judge of such strategic spots in their relation to state-wide highway planning.

This act fully protects all existing franchises heretofore granted by boards of supervisors.

Senate Bill No. 702, Chapter 765, Senator Fellom.

This bill repeals the old toll bridge act of 1881, which now requires the State Engineer to pass *solely* on draws and spans, but which does not vest real authority in him to pass on the general financial and engineering feasibility of toll structures.

Moreover, this archaic act will be rendered obsolete by the enactment of Senate Bill No. 701.

Senate Bill No. 538, Chapter 762, Senators Breed, Christian, Hurley, West, Canepa, Crowley, Fellom, Gray, Maloney, Murphy and Tubbs.

This act authorizes the California Toll Bridge Authority and the Department of Public Works to lay out, acquire and construct a bridge from San Francisco to Alameda County.

However, the cost of such a structure must be borne by the issuance of revenue bonds or by voluntary contributions of cities, counties or the city and county of San Francisco.

The effect of this bill is simply to give legislative sanction to the handling of the construction of a San Francisco Bay Bridge as a specific project under the revenue bond plan set up in Senate Bill No. 700.

ADDED POWERS OF CALIFORNIA HIGHWAY COMMISSION

Senate Bill No. 581, Chapter 579, Senator Handy.

Amends section 3636 of the Political Code in two respects.

1. The present law provides that the California Highway Commission may relinquish to any county, city or county any portion of any state road or highway within said county, city or city and

county with the consent of the governing body of such county, city or city and county.

This provision was voluntarily placed in the law some years ago by the Commission, but it has resulted in a few instances that a small town has declined to cooperate with the state and delayed a major line change or improvement.

Ordinarily there is the closest cooperation between the Commission and the counties and cities in the matter of state highway abandonments and relocations. There is no necessity for the present provision. Accordingly the legislature deemed it to be for the best interests of the state highway system to eliminate the requirement, leaving it to the California Highway Commission to determine relative necessities.

2. Under the present section the California Highway Commission is authorized to conduct preliminary surveys for the determination of the advisability of including in or excluding from the state highway system any road or a portion thereof, provided, that not more than one-half the cost of any such preliminary survey shall be paid from state funds available for such purposes.

The amended act eliminates any requirement for county aid, thus enabling the state to bear the entire cost of such preliminary surveys for potential state highways.

This amendment will pave the way for the making of the surveys contemplated by Senate Concurrent Resolution No. 19, for the study by the Department of Public Works of feasible additions to the secondary state highway system during the next biennium.

The act also adds a new section to the Political Code to be numbered 3636 and provides that the department of public works is authorized with the consent of the Railroad Commission to abandon any portion of a state highway crossing the tracks or right of way of any railroad, or street railroad.

PREQUALIFICATION OF BIDDERS ON STATE CONTRACTS

Senate Bill No. 754, Chapter 644, Senator Fellom.

This is another enabling act providing that the Department of Public Works may, within its discretion, before furnishing any person proposing to bid on any duly advertised public works with plans and specifications for the proposed public work, require from any such person answers to questions contained in a standard form of questionnaire and financial statement, including a complete statement of the person's financial ability and experience in performing public work.

Whenever the Department of Public Works is not satisfied with the sufficiency of the answers contained in such questionnaire and financial statement it may refuse to furnish such person with plans and specifications on any such duly advertised public work, and the bid of any person to whom plans and specifications have not been issued must be disregarded.

VENDING ON STATE HIGHWAYS

Senate Bill No. 42, Chapter 201, Senator Boggs.

This act provides that any person who sells, displays for sale, or offers to sell any wares, merchandise, fruit, vegetables, produce, food, or any or other goods from any vehicle, motor vehicle, trailer, semitrailer, wagon, push-cart, stand, structure or building standing or situated wholly or in part on the right of way of any state highway, or any part thereof, is guilty of a misdemeanor. The act, however, shall not be deemed to prohibit a seller from taking orders for or delivering any commodities from a vehicle on the part

of the right of way of a state highway immediately adjoining the premises of the purchaser.

PUBLICATION OF BULLETINS

Assembly Bill No. 1134, Chapter 381, Assemblyman Jespersen.

This act adds a new section to the Political Code to be numbered 363p. It authorizes the Department of Public Works to prepare, publish and issue such printed pamphlets and bulletins, as the Director of Public Works may deem necessary, for the dissemination of information to the public concerning the work and activities of the several divisions of the department. This act makes it possible to keep the public fully advised concerning the activities of the highway and the other divisions of the Department of Public Works.

TRANSFER OF DIVISION OF MOTOR VEHICLES TO DEPARTMENT OF PUBLIC WORKS

Assembly Bill No. 201, Chapter 318, Assemblyman Feigenbaum.

This act adds new sections to the Political Code numbered 363k, 363l and 363m. The placing of this division in the Department of Public Works will result in closer coordination of the activities of the Division of Highways, which constructs and maintains the state highways, and the Division of Motor Vehicles, a portion of whose duties is to enforce the laws relating to the safety of traffic on the state highway system and the protection of the highways themselves resulting from overloads and other abuses thereto.

MOTOR VEHICLE LEGISLATION

Senate Bill No. 714, Chapter 253, Senator Breed.

This act amends the California Vehicle Act in many particulars. Notably section 30 of the act is amended to provide for the creation of the California Highway Patrol. Traffic officers on the highways of California will hereafter be under the jurisdiction of the Department of Public Works and the present unsatisfactory "double headed" control by state and county authorities will cease.

It is believed that this centralized plan will result in more uniform enforcement and will subserve the best interests of the motorists of the state and of the public officers handling highway traffic and related problems in California.

TRAFFIC OFFICERS UNDER CIVIL SERVICE

Senate Bill No. 869, Chapter 308, Senator Breed.

This act places the California Highway Patrol under Civil Service regulations.

\$20,000 MINIMUM COUNTY SHARE GASOLINE TAX

Assembly Bill No. 1060, Chapter 789, Assemblyman Williams.

Fifteen counties, some of the greatest in area yet smallest in population, will benefit under this act.

The act changes the present method of apportioning the counties' money derived from the original 2-cent gas tax by providing that no county shall receive less than \$20,000 annually. Based on present returns, the counties which are to be benefited by this act are Alpine, Amador, Calaveras, Del Norte, El Dorado, Inyo, Lake, Mariposa, Modoc, Mono, Nevada, Plumas, Sierra, Trinity and Tuolumne.

SPECIAL LEGISLATIVE STUDIES

The legislature by resolutions provided for several special studies by legislative committees of problems

relating to highway and street matters. These are as follows:

STREET IMPROVEMENT LAWS

Assembly Concurrent Resolution No. 23, Chapter 52, Assemblymen Woolwine and Jespersen.

This resolution provides for the creation of a joint committee of the Senate and Assembly to study street improvement laws of the State of California and make recommendations concerning changes in existing laws.

BILL BOARD INVESTIGATION

Assembly Concurrent Resolution No. 27, Chapter 69, Assemblymen Ingels and Scofield.

This resolution provides for the appointment of a legislative committee to investigate the possibility of regulating and restricting advertising signs, bill boards, hot dog stands and unsightly structures by law, and to make recommendations in such behalf to the next legislature.

JOINT HIGHWAY DISTRICT ACT REVISION

Assembly Concurrent Resolution No. 41, Chapter 73, Assemblyman Luttrell.

This resolution provides for the creation of a joint committee of the Senate and Assembly to study joint highway district laws of the State of California, and to make recommendations concerning changes in existing laws to the next legislature.

THE TIMID STENOGR

"Now, Miss Blogg," boomed Jasper M. Whurtle, president of the Whurtle Whirlwind Laundry Co., to his new stenographer, "I want you to understand that when I dictate a letter I want it written *as dictated*, and not the way *you* think it should be. Understand?"

"Yes, sir," said Miss Blogg meekly.

"I fired three stenogs for revising my letters, see?"

"Yes, sir."

"All *right*—take a letter."

The next morning, Mr. O. J. Squizz, of the Squizz Flexible Soap Company, received the following:

"Mr. O. K. or A. or J. something, look it up, Squizz, President of the Squizz what a name Flexible Soap Co., the gyps,

Detroit, that's in Michigan, isn't it?

Dear Mr. Quizz, hmmm:

You're a h—of a business man. No, start over. He's a crook, but I can't insult him or the bum'll sue me. The last shipment of soap you sent us was of inferior quality and I want you to understand, no scratch out I want you to understand. Ah, unless you can ship, furnish, ship, no furnish us with your regular soap you needn't ship us no more period or whatever the grammar is and please pull down your skirt. This d— cigar is out again pardon me and furthermore where was I? Nice bob you have.

Paragraph. The soap you sent us wasn't fit to wash the dishes no make that dog with comma, let alone the laundry comma and we're sending it back period. Yours truly. Read that over, no never mind, I won't waste any more time on that egg. I'll look at the carbon tomorrow. Sign my name. We must go out to lunch soon, eh?"—*Judge*.

NEW MEXICO—Discovering that approximately 1800 standard marker signs had been destroyed in the year 1928 the state highway department has embarked on an educational campaign to combat this vandalism.

PERILS OF THE DESERT ARE CONQUERED BY STATE HIGHWAYS

(Continued from page 2.)

300 feet in height was scarcely perceptible. Accordingly, the new road was built on sand fills made level with the top of the thirty-foot dunes. In order to keep the high sand fills of the new road from blowing away these fills were oiled. The road was also located to avoid the high, slow-moving dunes.

Great as is this improvement, other betterments are planned for the next two years that will complete this work of civilizing the desert. Thus \$234,000 is to be spent from the state line at Yuma westerly in grading and paving five miles to the Indian reservation. This is now the worst portion of the highway. Nine miles from El Centro to Holtville also are to be paved during this same period, the allotment for this work in the budget being \$482,000. During the present biennium an underpass is being constructed at Araz on this highway, to which the state contributed \$25,000.

Route No. 26 of the state highway system extends from San Bernardino to El Centro and most of its 151 miles crosses the desert. On this road also the sands of the desert are yielding to the magic of the engineer. Allotments for this highway from the 1927-1929 budget, which have either been expended or are now in process of expenditure, total \$1,117,000. For the 1929-1931 biennium the allotment totals \$1,326,600.

On June 30, next, when the present biennium closes, 140 miles of this road will be paved and 11 miles will have an oil-mix surface. Improvements programmed for the 1929-1931 biennium include 10.5 miles of pavement, 31.9 miles of widening and thickening of existing pavement, culverts and grading of adequate shoulders to the extent of 7.2 miles and protection of approximately 20 miles of this highway from the effects of cloudbursts.

WHAT STATISTICS SHOW

Travel statistics again demonstrate how completely this road has robbed the desert of its terror. Traffic count on January 13, last, reveals the following travel: South of San Bernardino, 4864; west of Redlands, 5571; Beaumont, junction with Jack Rabbit Trail, 3657; south of Coachella, 1449; Westmoreland, 2620; Brawley Junction, 3340; El Centro, 5034.

Mecca to Blythe, state highway Route 64, is another road that has entirely changed the travel aspect of the country it traverses. This road was made a part of the highway system in 1919, but like other desert roads the first substantial improvements to be made on it were those authorized in the current budget.

The failure to make any substantial improvement on this until the present highway administration came into power is reflected in its low-travel count.

By no means least in its importance is the work being done upon the route that connects southern California and Boulder Canyon.

In order that southern California may reap the full advantage of the many million dollars that will be expended in the construction of Boulder Dam the California Highway Commission and B. B. Meek, Director of the Department of Public Works, have given orders for "full speed ahead" in the improvement of the highway that connects southern California with this monumental project.

Officially, the road connecting Boulder Dam and southern California is Route No. 31 of the state highway system, with its termini designated as San Bernardino to the Nevada line near Jean. Popularly, the road is known as the Arrowhead Trail. It connects the California highway system with the Nevada state highway system leading to Las Vegas, which in turn extends to Boulder Canyon.

ALLOTMENTS MADE

The allotments made by the California Highway Commission to this highway in the biennial budgets of 1927-1929 and 1929-1931 total \$1,180,000. And it may be that increased revenues and savings will make possible additional supplementary allocations during the latter biennium to this and to other desert highways of southern California.

For the biennium which begins July 1, allotments to this San Bernardino-Nevada state line highway total \$768,000. The budget provides for grading and surfacing with oiled rock 22.3 miles of the highway. It also provides for major alignment improvement on 6.5 miles and for rebuilding two bridges.

The type of permanent improvement adopted for surfacing the road is that of oil-treated crushed gravel or stone, now becoming known as "California type pavement." The work under way and that authorized for the next two years constitute the first real improvement of major character undertaken by the state on this highway since it was included in the state system. The completion of this program will leave 60 of the 188 miles of this road unimproved. The state, however, plans that the unimproved sections of the road shall be put in a condition to satisfactorily serve travel pending its more permanent improvement. For the unimproved sections the natural surface will be oiled to lay the dust. Certain sections where the surface is rough because of rocks will be treated with selected gravel. Dragging will enable a smoother surface to be obtained over all of the unimproved mileage. This work will be carried on under the general allotment for maintenance made to this highway.

RESIGNS POSITION

Harold T. Avery, office engineer for district five at San Luis Obispo, has resigned to accept the position of director of application with the Marchant Calculating Machine Company of Oakland, which company recently secured his patent rights to a calculating machine improvement. Mr. Avery has been connected with the Highway Commission for the past 16 years except during the period of the war at which time he was in the service as captain with the Engineer Corps.

During the time of his connection with the Division of Highways, Mr. Avery made many friends especially among his coworkers in the district office. As a token of friendship and with best wishes for his future success Mr. Avery was presented with an elaborate desk set by his coworkers.

The stout old lady was struggling valiantly, but against odds of some 200 pounds, to mount the high step of the waiting bus. "Come along, ma," urged the conductor. "If they had given you more yeast when you was a gal, you'd be able to rise better." "Yes, young man," she retorted, as at last she hoisted herself up triumphantly, "and if they had given you a bit more yeast, you'd be better bred."

TYPICAL ROAD SECTIONS

(Continued from page 8.)

Since on the railroad side no development of property is possible, sidewalk space has been omitted, and only sufficient space between the ultimate curb line and the right of way line is provided to place trees and poles. On the opposite side away from the railroad right of way, the same space is provided as on the typical section for the 100-foot width of right of way.

The fifth typical section shows a plan for developing the state highway to an ultimate 56-foot width for through traffic, and by use of setback lines to provide for the later construction of side roads or local service lanes as the abutting property develops.

This plan shows two half-width sections; one for an ultimate 160-foot right of way, the other for an ultimate 170-foot right of way. The difference between the two being in the width of the side road or local service lane, which on the 160-foot right of way is 30 feet in width, consisting of two 10-foot driving lanes, and one 8-foot parallel parking lane, and on the 170-foot right of way of a 35-foot side road or local service lane, consisting of two 10-foot driving lanes, and one 15-foot diagonal parking lane.

The ultimate development as shown provides a 56-foot width for through traffic, designed on the basis of four 10-foot driving lanes, and two 8-foot parallel parking lanes, with the local service lanes, previously described, separated from this through traffic road by parking strips 12 feet in width on which trees and light standards may be placed. It is to be noted that trees which may have been planted during the first construction, will remain undisturbed in the progressive development to the ultimate construction. This section may be considered the minimum development in territory which may be improved and become a business district.

The sixth typical section shows a plan for developing state highways to an ultimate 76-foot width. This is accomplished by establishing 50-foot setback lines from the original 100-foot right of way. This width will provide, in the future when abutting property develops into a business district, for a 76-foot road for through traffic, consisting of six 10-foot driving lanes and two 8-foot parallel parking lanes and local service roads on each side, 35 feet in width, consisting each of two 10-foot driving lanes and one 15-foot diagonal parking lane. These local service roads are separated from the through road, as in the previous section, by 12-foot parking strips.

This last section may be considered the maximum development and probably will apply only to a small mileage of the state highway system.

The various features outside of the roadway section surfacing or pavement, such as the various public utility facilities, pole lines, trees, etc., are placed upon the right of way under permits issued by the Division of Highways. These typical sections indicate the definite location for these various features and will provide that their installation under permit in the future will insure not only sufficient room for the development of our proper roadbed section, but will also obviate the necessity for their removal whenever widening or improvement of the road is undertaken.

The adoption of these definite sections permits the carrying out of a well formed policy relative to stage construction of the highway in an orderly, economical, progressive development keeping pace with the traffic requirements and leading to the ultimate development therein illustrated.

FIGURE THIS OUT

A statistician has been defined as one who knows less and less about more and more until finally he comes to know everything about nothing. Bearing this out please note below the labor of one of the office statisticians:

	Days
In one year-----	365
If you sleep 8 hours a day that makes-----	122
That leaves-----	243
If you rest 8 hours a day that makes-----	122
That leaves-----	121
There are 52 Sundays-----	52
That leaves-----	69
If you have $\frac{1}{2}$ day Saturdays-----	28
That leaves-----	41
If you have $1\frac{1}{2}$ hours lunch-----	26
That leaves-----	15
Two weeks' vacation-----	14
That leaves-----	1

And this is Labor Day, no one works. You don't have to work after all.

Perfectly simple, isn't it?

ALBERTA—On the provincial road system, 1140 miles has been brought to grade and provided with culverts, 827 miles given one or two courses of gravel, and 41 miles given clay, shale or other surfacing. Grading has averaged 38 per cent of the cost, surfacing 39 per cent, miscellaneous 10.5 per cent, and drainage 12.5 per cent.

Progress Reports From the Counties

ALAMEDA COUNTY

The construction of more than 3 miles of laminated guard rail on the Dublin Canyon Road between Dublin and Hayward, by Contractor Lee J. Immel of Berkeley, has been completed and the need of same was proven before completion by the fact that several automobiles crashed through the guard rail before the contractor left the job.

The widening of the section of the Oakland-San Jose road between Hayward and Niles is contemplated in the near future, and advertisements for same are expected immediately.

COLUSA COUNTY

The plans and estimates for constructing 15.6 miles of highway from Abbott Mine, Lake County, to Salt Creek Canyon, part of the Ukiah-Tahoe Highway, have been completed, and provide for a 24-foot roadbed. The work will be done by convict labor forces continuing the work done in Lake County by the same labor forces.

CONTRA COSTA COUNTY

The construction of the Martinez Road through Pinole and Hercules is nearing completion. In conjunction with the other work lately completed on this road, this essential link will be much appreciated by the traveling public on this, the second heaviest traveled road in northern California, as the former crooked and narrow road through these two towns has long been an inferior section.

DEL NORTE COUNTY

Parker Schram Company have completed the erection of the steel and are placing the concrete deck on the bridge over Smith River, approximately nine miles east of Crescent City. As soon as this bridge work is completed, it will open up to the traveling public approximately seven miles of new highway which has very little use at present.

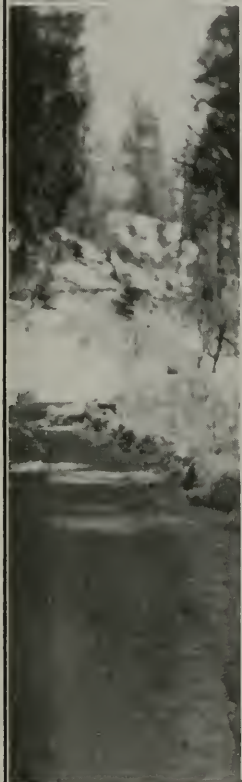
It is expected that the Holdener Construction Company will reopen their oil surfacing work on their contract between Smith River and the state line by the middle of May.

The Webber Construction Company were recently awarded the contract for placing crushed rock surfacing and stock piling macadam rock for that portion of the highway between Elk Valley and the new Smith River Bridge being built by Parker Schram Company. It is expected that work will start on this surfacing approximately the first of May.

J. E. Johnston, who has the contract for grading and surfacing between the Klamath River and Wilson Creek, has again resumed operations after the winter shut-down and expects to have the new road open to public travel before the heavy touring season.

Mr. Johnston also has the contract for grading and surfacing between the Humboldt-Del Norte County line and the Head of Richardson Creek, 3.5 miles northerly. The work was practically complete, but owing to numerous slides during the winter, there is considerable excavation and finishing work necessary before the entire job will be complete. Traffic, however, is being carried over the new work and being handled very much easier than when it was carried over the old county road.

The Weber Construction Company has also been awarded the contract for furnishing rock and surfacing that portion of the highway between the Head of Richardson Creek and Klamath River, approximately 2.1 miles. Mr. Weber expects to set up his crushing



FREEING MOUNTAIN ROADS OF SNOW

UPPER PICTURE, AHEAD
OF THE PLOW; CENTER
PICTURE, BEHIND THE
PLOW; LOWER PIC-
TURE, CLOSE-UP OF
EQUIPMENT.



outfit near the Head of Richardson Creek at the southerly end of the contract.

EL DORADO COUNTY

Grading of 5.1 miles of the Lincoln Highway along the south shore of Lake Tahoe (Mays Station to the Nevada State line) has begun. This project will greatly favor the rapidly growing resort and summer home districts in this vicinity, and will also invite more of the central California-Reno traffic to use this scenic route. The road will be 36 feet wide with no sharp curves nor steep grades. L. W. Hesse has contracted with the state to do this work.

FRESNO COUNTY

The bridge over the San Joaquin River at Herndon has been completed and main line traffic is now relieved of two railroad grade crossings and a narrow bridge.

A convict camp for road work is being established in the Kings River Canyon by Superintendent D. M. Lee.

Tieslau Bros., were low bidders on the oil mixed surface job from Coalinga west on the Sierra-to-the-Sea Highway.

GLENN COUNTY

The grade widening of 5 miles of roadway from Logandale to Willows is nearly complete, and the work of graveling has begun by E. C. Coates, contractor. This 12-inch gravel subbase is the second step of reconstructing this highway for an ultimate 40-foot concrete pavement, and the elimination of the present pavement failures due to the high water table and adobe soil.

HUMBOLDT COUNTY

The Webber Construction Company is awarded the contracts for furnishing and stock piling macadam rock for 15 miles of highway between Orick and the northerly boundary of Humboldt County. Mr. Webber states that he expects very shortly to set up his plant approximately three miles north of Orick.

W. C. Elsemore was low bidder on the contract for furnishing, crushing and stock piling macadam rock for the 6.3 miles between Mill Creek and Little River. It is expected that operations on this contract will start in the very near future.

Ellison & Smith, Contractors, were awarded the contract for grading and surfacing 0.9 mile of state highway between Mad River and Mill Creek. Ellison & Smith are moving onto the job and expect to immediately start excavation.

The Butte Construction Company have started breaking ground for the construction of the new bridge over Mad River. The new bridge is to have a total length of 700 feet and will have two 150-foot steel truss spans over the main stream.

Kennedy and Bayles have just been awarded the contract for the construction of the highway between Arcata and Mad River. They state that they expect to begin work immediately and equipment will be on the ground in the near future.

The state force work on the small line change in the vicinity of Little River is practically two-thirds complete. This line change will straighten out a bad curve in the road and will be a decided improvement at this intersection with the county road leading to Crannell.

Through the town of Wildwood, immediately north of Scotia, the highway is being reggraded to a 100-foot width for approximately 500 feet through the portion of the business district. This work is practically completed.

INYO COUNTY

The Southwest Paving Company has completed its contract for grading and surfacing with oil treated, crushed gravel or stone, between Olancha and Cottonwood Creek, 9.3 miles in length. The work on this contract extended from October 12, 1928, to May 7, 1929. With the completion of this project another unit of desert, sandy road with expensive maintenance costs has been eliminated. V. E. Pearson was resident engineer in charge of this work for the state.

Between Cottonwood Creek and Diaz Lake, G. W. Ellis has a contract for grading and surfacing 10.3 miles of state highway. The work is progressing satisfactorily, being about 50 per cent completed. H. M. Hansen is the resident engineer in charge of this work for the state.

Oiling of portions of the state highway were necessary—is being done by state forces.

Surveys are complete and plans in progress for proposed construction between Coso Junction and Olancha.

KERN COUNTY

The Valley Paving Company have completed their contract for an asphaltic concrete surface between Famosa and Wasco on the Cholame Lateral.

Force, Currigan & McLeod are making rapid progress on their contract for grading and surfacing on Route 57, from Bakersfield to the mouth of the Kern River Canyon.

C. W. Hartman is placing rock base under his contract for grading and rock surfacing east of Maricopa on Route 57.

Between Mojave and 7 miles south of Cinco, a contract for grading a 36-foot roadbed and surfacing with oil treated, crushed gravel or stone is progressing very satisfactorily. The work is being done by Bartlett and Mathews.

S. C. Risley in resident engineer in charge of the work for the state.

A contract has been awarded the Southwest Paving Company for grading and surfacing 7.3 miles of the state highway between 7 miles south of Cinco and Cinco. The contractor has forces and equipment well organized and the work is progressing satisfactorily. Walter Mathews is the resident engineer on this project.

G. W. Ellis, contractor, is working on his contract for grading and surfacing between 7 miles north of Ricardo and Freeman. The work is progressing satisfactorily. E. W. Sharp is in charge of the work for the state.

Bartlett and Mathews, Hagey and Black have been awarded the contract for grading and surfacing 13.5 miles of state highway between Freeman and the northerly county boundary. The approval of this contract by the attorney is pending. Oiling of portions of the state highway were necessary—is being done by state forces. Surveys have been completed between Cinco and 5 miles north of Ricardo and plans are being prepared for the proposed construction.

LAKE COUNTY

The grading of the Ukiah-Tahoe road between Clear Lake Oaks and Sweet Hollow Summit has been completed by convict labor forces. From the Summit to Abbot Mine the 20-foot graded roadbed is being widened to 24 feet.

Hemstreet and Bell have recently contracted to place a 20-foot crushed rock and oil mix surface from High Valley Creek to Abbott Mine, about 15.6 miles.

MADERA COUNTY

Hanrahan Company Contractors, have completed their contracts for resurfacing and paving at Berenda and Herndon.

MARIN COUNTY

This scenic bay county is coming into its own. A million dollars worth of road work is under way and more is to come.

Granfield, Farrar & Carlin, San Francisco Contractors, are doing three pieces of road work; the construction of a 30-foot bituminous macadam on the 3 miles between San Rafael and San Quentin; a similar job on the 0.6-mile connection on the Alto Tiburon Road between the old Sausalito Road and the new location of same; and the grading of the 5½-mile stretch connecting the two other jobs and on the aforementioned new location. The coordinating of these three jobs is noteworthy, in that the grading on the first two jobs finished just as the third and connecting job was awarded, and four steam and gas shovels were available and were put on the job of excavating the 423,000 cu. yds. of material involved, without any loss of time. Also, the contractor was low bidder by a margin of less than \$800 on the total price of \$293,447.35. This later section is to be surfaced with a 30-foot bituminous macadam pavement as soon as the grading is completed.

A 3½-mile stretch between Alto and Sausalito was recently surfaced with asphalt concrete by the Hollywood Paving Co. and is a very fine piece of road.

Considerable county work is also under way.

MARIPOSA COUNTY

Lust oiling and oil mixing work on the Yosemite All-Year-Highway is being pushed and it is expected to have the road in first-class condition by the first of July.

MENDOCINO COUNTY

With the coming of the summer weather, it is expected that the recently advertised contract for the construction of wooden bridges and of several line changes on the McDonald-to-the-Sea Road, between Boonville and Navarro will be awarded and work started immediately to allow of completion before the winter rains, which, as those who are familiar with this section know, start about October and Continue, in capital letters, for some time and in such a way as to prohibit any road work for said time. The improvement of this highway is very desirable as it opens up to the public one of the finest vacation lands in the state, and also brings many of our oldest settlers closer to the heart of the state.

The state force work of widening the present narrow roadway approximately five miles north of Lane's Redwood Flat, is well advanced and the widened roadway will be of great benefit to the traveling public during the coming summer. It is expected that this work will be shut down during the heavy touring season.

MERCED COUNTY

Shoulders on Route 18, east of Merced, are being widened by day-labor forces and placing of rock shoulders will start at once.

MONO COUNTY

D. C. Follis is the contractor for the construction of about 1.5 miles of grading at Hilton Creek. The work was slow in getting under way, but is now progressing satisfactorily. T. T. Black is resident engineer in charge of the work for the state.

MONTEREY COUNTY

Plans have been completed for an extensive line change, south of the Salinas River Bridge at San Ardo. Realignment 0.6 of a mile in length will

eliminate a blind 300 feet radius curve on practically a right angle turn and on a 6 per cent grade.

Between Greenfield and King City two line changes approximately 0.2 and 0.5 miles in length are now under construction. The work consisting of a graded roadbed 30 feet in width with 20 feet by 6 inches waterbound macadam surfacing. Work is being done under contract with Granite Construction Company. Three bad curves where numerous accidents have occurred are eliminated by this contract.

Between Salinas and Chualar plans have been prepared for an overhead crossing over the Southern Pacific Railroad, at a point locally known as Spence Crossing. The plans prepared involve realignment for a distance of 0.6 miles with an overhead bridge approximately 1000 feet in length.

On the Carmel-San Simeon Highway construction work is in progress both north and south of the Little Sur River and between Salmon Creek and Villa Creek, the work being carried on by the use of state convict labor. A crew of approximately 80 men and two power shovels are working in the vicinity of the Little Sur River and 180 men and two power shovels are building north from Salmon Creek.

In the vicinity of the Carmel Highlands surveys have been completed. Preliminary investigations and studies are now being made to determine possible relocations of the highway in this vicinity.

Between San Ardo and San Lucas the construction of a line change 0.4 miles in length consisting of a graded roadbed 30 feet in width and surfaced with 20 feet by 6 inches waterbound macadam, was recently completed by W. A. Dontanville as Contractor.

This realignment eliminated a bad curve, the cause of several accidents.

Plans are now in progress for the complete reconstruction of the Coast Highway between Salinas and Chualar.

NAPA COUNTY

The improvement of the highway between Napa and the easterly county border is contemplated immediately, bids to be taken to widen the existing road from Napa to Greenwood Corner with oil treated crushed gravel or stone borders; and also bids to construct a bituminous macadam surface from Greenwood Corner to the easterly boundary.

NEVADA COUNTY

Grading for a state highway has been resumed between Indian Springs and Soda Springs near the summit of the Colfax-Truckee road. Travel is being maintained through the construction with very little inconvenience.

C. R. Adams was awarded the contract for grading and surfacing 11.7 miles between Nevada City and Washington Road, and this work is well under way. This section, consistent with the rest of the Ukiah-Tahoe Highway, will consist of a 24-foot roadbed. An oil mixed crushed rock surface, 20 feet wide, is to be placed by the terms of the contract.

PLACER COUNTY

Overhead crossings of the Southern Pacific Railroad at Bowman and Weimar on the Auburn-Colfax road have been completed. At Bowman two new concrete spans replace the old unsightly timber structures and greatly improve the former alignment. At Weimar a hazardous grade crossing is eliminated. All three structures were built by the Butte Construction Company, and have 24-foot roadways with 5-foot sidewalks on one side.

Fredrickson-Watson Construction Company & Fredrickson Brothers are rapidly completing the approaches to these structures and it is expected they will be completed the latter part of June.

SACRAMENTO COUNTY

Fredrickson-Watson Construction Company & Fredrickson Brothers were awarded the construction of

8.7 miles of Portland cement concrete pavement on the Sacramento-Roseville road between Ben Ali and Sylvan School. This work will involve considerable traffic control as this road carries a major portion of northern California travel, and particularly on account of the Western States Exposition to be held at Sacramento in September. Although several county roads, which are in fair condition, are available for detours, the contractor is required to construct the road in several units so the inconvenience to traffic will be a minimum.

SAN BENITO COUNTY

Preliminary surveys for an improved road connecting Hollister and Pinnacles National Forest by way of Paicines are nearly complete and plans for construction are now being prepared in the district office. This work is being carried on to cooperate with the board of supervisors of San Benito County.

On the Coast Highway, north of San Juan, a non-skid surface is now being placed. South of San Juan and over the San Juan grade the traffic stripe is being renewed. Work being done by the district maintenance.

SAN LUIS OBISPO COUNTY

On the Coast Highway between Arroyo Grande and Pismo the construction of 3.3 miles of grading and paving has recently been started by the Cornwall Construction Company.

Extending from Pismo to San Luis Obispo on the Coast Highway, the construction of a project 10.8 miles in length including grading and paving was recently completed in a satisfactory manner by J. F. Knapp, Contractor.

This project involved considerable realignment and resulted in a highly improved roadway connecting San Luis Obispo and the beach.

North from the city limits of San Luis Obispo the highway is to be realigned for one mile and graded to a roadbed width of 36 feet and surfaced with water-bound macadam 20 feet by 6 inches in width with an oil treated surface. Contract for this construction was recently awarded to the Ariss-Knapp Construction Company.

At Santa Margarita, survey and plans have been completed for reconstruction on a line change at the north end of the town. The proposed construction will eliminate a sharp curve on which is located a narrow concrete bridge of early design. The proposed work will include the construction of a new bridge with a change in the existing creek channel.

Surveys and plans are in progress for the reconstruction of the Coast Highway over a distance of 10.2 miles, between Atascadero and Paso Robles. The work contemplated consists of widening the existing roadbed to an overall width of 36 feet, and the paving reconstructed to a width of 20 feet. Changes in alignment will eliminate several dangerous curves.

On the Cholame Lateral, from a point 1.7 miles west of Shandon to the San Luis Obispo-Kern County Line, a distance of 15.4 miles, the existing highway is now being reggraded to a roadbed width of 24 feet and surfaced with bituminous macadam 20 feet in width. The construction is being carried on under contract with A. Teichert and Son.

On the Carmel-San Simeon Highway two wooden bridges are now under construction, one 266 feet long across the Arroyo la Cruz Creek and one 171 feet long across the San Carpojo Creek. These bridges are being built by Chas. and F. W. Steffen under the supervision of the Bridge Department.

The approaches to both the above bridges involving the grading and surfacing of approximately one mile of roadway, on realignment, is being handled under contract with W. J. Taylor.

Construction of the new equipment shops and storage sheds in San Luis Obispo is progressing under contract with W. J. Smith.

South of San Luis Obispo a reinforced concrete bridge 266 feet in length over the San Luis Creek was recently completed by Chas. and F. W. Steffen as Contractors. The completion of this bridge opens to traffic the entire project between San Luis Obispo and Pismo.

South of Santa Margarita plans are in progress covering extensive realignment and grade changes extending north from the foot of Cuesta Grade 1.9 miles.

SAN MATEO COUNTY

H. W. Rohl's contract on the Bayshore Highway between San Francisco and South San Francisco is assuming a shape where the bigness of the work is plainly seen. A long concrete under pass to accommodate a railroad spur and a double 8-foot by 9-foot concrete box in piles and heavy concrete mat floor, also a heavy rubble masonry wall have been completed. The heavy cut through Visitation Point fill across Guadalupe Canal and much of the Sierra Point Cut with a maximum centerline cut of 84 feet, stand out as massive sections of a stupendous project. Costing close to a million dollars, and standing as its does, the throat of the main business artery out of San Francisco, this road may well be said to control much of the life of that great city. Progress on the work has been good and it can be seen that by the time the city of San Francisco has finished its portion of the work to the city limits, this work will be ready to take its share of the rapidly increasing traffic.

This work has been carried on with little inconvenience to traffic, as it does not use much of the old road, and where it does, great care has been taken, in one place a wooden structure being built to carry operations over the traveled road. The public have coordinated with the contractor and state to a marked degree on this work, accepting it as their own and treating it as such.

SANTA BARBARA COUNTY

On the Coast Highway between Benham and Carpinteria a line change over the Rincon Hill is under construction, which involves the grading of a roadbed 46 feet wide, to be paved with concrete 30 feet in width. This work is being carried on under contract with McCray Company.

Included in the above line change a steel and concrete overhead bridge 570 feet in length is being constructed over the main line tracks of the Southern Pacific Railroad. A reinforced concrete arch culvert 20 feet by 17 feet 5 inches of special design is being constructed at the Rincon Creek. The two structures are being built under contract with Paul M. White and are being handled under the supervision of the Bridge Department.

South of Montecito 0.3 miles of construction is under way involving the grading of a roadbed 46 feet in width to be paved with concrete 30 feet wide. The work is being carried out under contract with the Cornwall Construction Company.

Between Goleta and Naples, for a distance of 3.5 miles, construction is in progress involving the grading of a roadbed 36 feet in width, to be paved with second story asphalt concrete 20 feet in width. This work is being carried on under contract with San Hunter. In the Gaviota Canyon between Las Cruces and Gaviota, surveys for an extensive realignment of the existing highway have been completed and plans for construction are now in progress in the district office.

SAN MATEO, SANTA CLARA AND SANTA CRUZ COUNTIES

The Skyline Boulevard between La Honda Road and Saratoga is nearly complete, grading is done except daylighting some fine observation points and some slope trimming. The placing of crushed rock surface is nearly completed.

It is planned to place an armor coat of oil and screenings before opening it to traffic and this work is to start soon.

SONOMA COUNTY

The 11.44 miles of second story concrete pavement between Santa Rosa and Willow Brook, E. Paul Ford, Assignee of H. H. Peterson, Contractor, is open to traffic and needs only shoulder work to be completed. This concrete has been placed in record time and in highly satisfactory manner, and the entire job is a fine section of one of the scenic roads of the state, the Redwood Highway.

The cross road from the coast counties to the central counties, the Black Point Cutoff, is being resurfaced for 7.3 miles with bituminous macadam by Teichert & Sons, Contractors of Sacramento. This will put the entire road from the Redwood Highway to Napa County line in fine shape, except for a mile of poor alignment near Fairville, which section it is hoped to relocate and reconstruct in the near future.

TULARE COUNTY

Day labor forces are constructing a masonry wall at a dangerous point on Route 10 east of Lemon Cove. Fred W. Nighbert has completed his contract for an oil-mixed surface at the connection of the Sierra-to-the-Sea Highway with the Generals Highway in Sequoia National Park.

Record of Bids and Awards

BUTTE COUNTY—Between Oroville and Feather River, grading and surfacing with untreated crushed gravel or stone, 4.1 miles. Dist. II, Rt. 21, Sec. B. Paul J. Tyler, Oroville, \$229,838; Guy F. Atkinson Co., San Francisco, \$117,948.50; Utah Construction Co., San Francisco, \$202,514; Finnell Co., Inc., Sacramento, \$200,284; Arris-Knapp, Oakland, \$167,073; Lord & Bishop, Oroville, \$254,331; A. J. & J. L. Fairbanks, Inc., South San Francisco, \$212,809; Contoules Const. Co., San Francisco, \$179,715; John F. Collins, Stockton, \$204,349; T. E. Connolly, San Francisco, \$203,266; W. H. Hauser, Oakland, \$206,916. Contract awarded to Arris-Knapp, Oakland, \$167,073.

DEL NORTE COUNTY—Between head of Richardson Creek and Klamath River, furnishing rock. Dist. I, Rt. 1, Sec. A. J. E. Johnston, \$12,890. Contract awarded to Webber Const. Co., \$10,175.

DEL NORTE COUNTY—Between Elk Valley and Smith River, 3.8 miles crushed gravel or stone surfacing. Dist. I, Rt. 1, Sec. C. Smith Brothers, Eureka, \$21,340; Tieslau Bros., Berkeley, \$25,100. Contract awarded to Webber Const. Co., Crescent City, \$21,294.

DEL NORTE COUNTY—Bridge across Hardscrabble Creek. Dist. I, Rt. 1, Sec. C. Parker-Schram Co., Portland, Oregon, \$16,452; Webber Const. Co., Crescent City, \$15,112; Calvert & Schroder, Grants Pass, \$16,547; Smith Bros., Eureka, \$16,425. Contract awarded to Webber Const. Co., \$15,112.

EL DORADO COUNTY—Mays Station to Nevada state line, grading 5.1 miles. Dist. III, Rt. 2, Sec. K. L. W. Heese, Merced, \$30,075; Finnell Co., Inc., Sacramento, \$34,254; Isbell Const. Co., Carson City, \$38,162; Tieslau Bros., Berkeley, \$42,701; Charles Miles, Sacramento, \$38,369. Contract awarded to L. W. Heese, \$30,075.

FRESNO COUNTY—From 3 miles east of Parkfield Junction and Coalinga, 6.7 miles to be surfaced with oil treated crushed gravel or stone. Dist. VI, Rt. 10, Sec. C. W. J. Taylor, Palo Alto, \$44,272; Montfort & Armstrong, Sacramento, \$45,613; Tieslau Bros., Berkeley, \$41,158; Fred W. Nighbert, Bakersfield, \$45,698; Tiffany, McReynolds, Tiffany, San Jose, \$43,550. Contract awarded to Tieslau Bros., \$41,158.

GLENN COUNTY—Between Logandale and Willows, 5 miles surfaced with pit run gravel. Dist. III, Rt. 7, Sec. A. E. C. Coats, Sacramento, \$30,022.50; Hansen, Sutton & Griffin, Anaheim, \$64,901; G. E. Finnell, Sacramento, \$39,171; Pacific Const. Co., San Francisco, \$41,943; Chittenden & Hein Bros., Napa and Petaluma, \$52,760; Hemstreet & Bell, Marysville, \$25,321; L. C. & W. E. Karstedt, San Jose, \$30,243; D. McDonald, Sacramento, \$49,185; W. C. Colley, Berkeley, \$46,358; A. F. Giddings, Sacramento, \$40,177; Homer G. Johnson, Roseburg, \$63,798; J. F. Collins, Stockton, \$33,554; J. R. Reeves, Sacramento, \$40,729; Deysher & La Fargue, San Anselmo, \$49,669; Tiffany, McReynolds, Tiffany, San Jose, \$33,113. Contract awarded to E. C. Coats, \$30,022.

HUMBOLDT COUNTY—Between Mad River and Mill Creek, 0.9 mile grading and surfacing with crusher run base. Dist. I, Rt. 1, Sec. I. Pyle & Hall, Eugene, Oregon, \$42,088; J. E. Johnston, Stockton, \$46,868; Tieslau Bros., Berkeley, \$43,652; Pacific Const. Co., San Francisco, \$53,067; Smith Bros. Co., Eureka, \$49,320; Mercer-Fraser Co., Eureka, \$47,295; H. J. Kennedy & Daniel Bayles, Oakland, \$44,847; Englehart Paving & Const. Co., Eureka, \$41,802; W. H. Hauser, Oakland, \$57,223; Ellison & Smith, Fort Bragg, \$34,914; G. E. Finnell, Sacramento, \$42,081; E. C. Coats, Sacramento, \$44,597. Contract awarded to Ellison & Smith, Fort Bragg, \$34,914.

HUMBOLDT COUNTY—Between Arcata and 0.3 miles north of Mad River, 3 miles grading and sur-

facing with crusher run base. Dist. I, Rt. 1, Sec. I. W. H. Hauser Co., Oakland, \$95,385; G. E. Finnell, Sacramento, \$107,819; E. C. Hall, Eugene, Oregon, \$110,316; H. J. Kennedy & Daniel Bayles, Oakland, \$54,705; G. D. Contoules, San Francisco, \$96,229; Guy F. Pyle, Eugene, Oregon, \$106,549; Geo. Mitchell Co., Huntington Park, \$104,117; Tieslau Bros., Berkeley, \$113,787; E. C. Coats, Sacramento, \$87,241; Larsen Bros., Sonoma, \$88,291; Mercer-Fraser Co., Eureka, \$119,352; R. L. Oakley Palo Alto, \$119,825; Smith Bros. Co., Eureka, \$105,565. Contract awarded to H. J. Kennedy and Daniel Bayles, Oakland, \$84,705.

HUMBOLDT COUNTY—Between 1 mile south of Orick and Russ Grove, producing and stockpiling crushed gravel. Dist. I, Rt. 1, Sec. K. Englehart Paving & Const. Co., Eureka, \$26,468; Harold Smith, St. Helena, \$24,835; Smith Bros., Eureka, \$20,729; Wm. C. Elesmore, Eureka, \$24,922; Tieslau Bros., Berkeley, \$26,857. Contract awarded to Webber Const. Co., Crescent City, \$20,560.

HUMBOLDT COUNTY—Between Russ Grove and northerly county boundary, producing and stockpiling crushed gravel. Dist. I, Rt. 1, Sec. K. Tieslau Bros., Berkeley, \$26,295; Smith Bros. Co., Eureka, \$19,440; Webber Const. Co., Crescent City, \$17,240; Harold Smith, St. Helena, \$21,230; Englehart Paving Co., Eureka, \$22,194. Contract awarded to Webber Const. Co., \$17,240.

HUMBOLDT COUNTY—Between Mill Creek and Little River, producing and stockpiling broken stone and screenings. Dist. I, Rt. 1, Sec. I. Harold Smith, St. Helena, \$20,885; Kern & Kibbie, Portland, \$20,362; Englehart Paving & Const., Eureka, \$11,739. Contract awarded to Wm. C. Elesmore, Eureka, \$17,367.

HUMBOLDT COUNTY—Between Little River and Trinidad, 4.3 miles surfacing with crushed gravel or stone. Dist. I, Rt. 1, Sec. I. Chittenden & Hein Bros., Napa and Petaluma, \$35,852. Contract awarded to Kern & Kibbie, Portland, \$27,780.

HUMBOLDT COUNTY—Between Loleta and Beatrice, 3.7 miles to be graded. Dist. I, Rt. 1, Sec. G. Newport Construction, Portland, \$83,381; W. H. Hauser, Oakland, \$86,650; Contoules Construction, San Francisco, \$100,100; G. E. Finnell, Sacramento, \$98,247; A. J. & J. L. Fairbanks, Inc., South San Francisco, \$108,561; E. C. Hall, Eugene, Oregon, \$88,777; L. W. Heese, Merced, \$105,889; Smith Bros., Co., Eureka, \$109,273; Mercer-Fraser Co., Eureka, \$112,813. Contract awarded to E. C. Coats, Sacramento, \$83,114.

HUMBOLDT COUNTY—Between Big Lagoon and Orick, 3.3 miles to be surfaced with untreated crushed gravel or stone. Dist. I, Rt. 1, Sec. J. Harold Smith, St. Helena, \$35,661. Contract awarded to Englehart Paving & Const. Co., Eureka, \$32,740.

HUMBOLDT COUNTY—Between 1 and 3½ miles north of Arcata, 1 overhead crossing and 7 timber bridges. Dist. I, Rt. 1, Sec. I. M. B. McGowan, San Francisco, \$67,564; Mercer-Fraser Co., Eureka, \$56,257; Butte Const. Co., San Francisco, \$66,363; Fred J. Maurer & Son, Eureka, \$63,949; Smith Bros., Eureka, \$64,606. Contract awarded to Mercer-Fraser Co., \$56,257.

HUMBOLDT-DEL NORTE COUNTIES—Hauling heated asphaltic road oil and fuel oil from state plant at Trinidad to state maintenance yard at Crescent City. Dist. I, Rt. 1. John West, Redding, \$15,295; A. G. Raisch, San Francisco, \$13,127; Deysher & La Fargue, San Anselmo, \$14,110; Hess Bros., Weott, Humboldt Co., \$11,144; Harry H. Howell, Arcata, \$14,000; Basalt Rock Co., Inc., Napa, \$10,740; R. L. Hansen and Wm. Kern, Eureka, \$14,829; E. H. Baker, Santa Rosa, \$10,091; Webber Const. Co., Crescent City, \$10,951. Contract awarded to E. H. Baker.

KERN COUNTY—Between 7 miles south of Cinco and Cinco, 7.3 miles to be graded and surfaced with oil treated crushed gravel. Dist. IX, Rt. 23, Sec. B. Bartlett & Mathews, Mojave, \$76,014; Fred W. Nighbert, Bakersfield, \$95,841. Contract awarded to Southwest Paving Co., Los Angeles, \$74,532.

KERN COUNTY—Between Freeman and Northerly boundary, 13.9 miles to be graded and surfaced with oil treated crushed gravel. Dist. IX, Rt. 23, Sec. E. Finnell Co., Inc., Sacramento, \$217,923; George Herz Co., San Bernardino, \$149,986; Southwest Paving Co., Los Angeles, \$147,212; G. W. Ellis, Glendale, \$156,532. Contract awarded to Bartlett & Mathews-Black & Hagev, Mojave, \$137,274.

LAKE COUNTY—From High Valley Creek to Abbott Mine, 15.6 miles to be surfaced with oil treated crushed gravel. Dist. III, Rt. 15, Sec. B.C. Larsen Bros., Sonoma, \$162,872; Tieslau Bros., Berkeley, \$113,282; A. J. Grier, Oakland, \$114,100; T. E. Connolly, San Francisco, \$118,011. Contract awarded to Hemstreet & Bell, Marysville, \$104,101.

LASSEN COUNTY—Between Doyle and Long Valley Creek, 5.5 miles grading. Dist. II, Rt. 29, Sec. E.

Dovering & Co., Klamath Falls, Oregon, \$57,954; J. F. Collins, Stockton, \$49,562; G. E. Finnell, Sacramento, \$63,505; Tieslau Bros., Berkeley, \$65,650; Charles Miles, Sacramento, \$49,747; Meyer Rosenberg San Francisco, \$45,942; Dodge Bros., Inc., Fallon, Nevada, \$46,890; C. A. Bayles, Biggs, \$68,747; T. E. Connolly, San Francisco, \$74,590; Isbell Const. Co., Fresno, \$49,373; Arthur Jones, Newhall, \$52,654; J. P. Brennan, \$62,366. Contract awarded to Meyer Rosenberg, San Francisco, \$45,942.

LASSEN COUNTY—Seven timber bridges across Long Valley Creek and 4 timber cattle passes, near Doyle. Dist. II, Rt. 29, Sec. E. Smith Bros., Eureka, \$38,132; A. W. Kitchen, San Francisco, \$42,446; C. C. Gildersleeve, Felton, \$41,985; Bodenhamer Const. Co., San Diego, \$39,668; Ben C. Gerwick, Inc., San Francisco, \$44,220; Healy-Tibbitts Const. Co., San Francisco, \$40,685; Lord & Bishop, Oroville, \$39,500; E. B. Skeels, Roseville, \$43,865; R. B. McKenzie, \$39,234; E. M. McGuire, Davis, \$45,598; J. A. Bryant, San Francisco, \$46,470; H. C. Whitty, Sanger, \$41,945; M. B. McGowan, San Francisco, \$44,040. Contract awarded to F. H. Nielson, Orland, \$37,741.

LASSEN COUNTY—Near Doyle, undergrade crossing under the Western Pacific R. R. tracks. Dist. II, Rt. 29, Sec. E. F. H. Nielson, Orland, \$22,929; Tieslau Bros., Berkeley, \$28,755; A. P. Brady, San Francisco, \$23,460; Stephenson Const. Co., San Francisco, \$23,133; E. B. Skeels, Roseville, \$23,635; H. E. Whitty, Sanger, \$24,077; The Adams Co., Angels Camp, \$24,943; Healy-Tibbitts Const. Co., San Francisco, \$22,252; Lord & Bishop, Oroville, \$22,098. Contract awarded to C. C. Gildersleeve, Felton, \$20,941.

MARIN COUNTY—4.6 miles to be graded between San Rafael and Alto. Dist. IV, Rt. 1, Sec. C. Ariss-Knapp Co., Oakland, \$315,171; Guy F. Atkinson Co., Valley Springs, \$380,241; Twoby Bros. & J. F. Shea Co., San Francisco, \$301,768; Granfield-Farrar & Carlin, San Francisco, \$293,447; George Mitchell Co., Huntington Park, \$295,013; H. W. Rohl Co., Los Angeles, \$294,237; Raggio & Sartoris, San Francisco, \$302,445; T. E. Connolly, San Francisco, \$346,483; Wren & Greenough, Portland, \$305,709; Marsh Bros. & Gardener, Inc., San Francisco, \$326,303; Nevada Const. Co., Fallon, Nevada, \$331,420. Contract awarded to Granfield-Farrar & Carlin, \$293,447.

MARIN COUNTY—Overhead crossing over the Northwestern Pacific R. R. near Alto. Dist. IV, Rt. 52, Sec. A. Fredrickson Bros. and Fredrickson & Watson Const. Co., Oakland, \$45,880; D. S. Clinton, San Francisco, \$51,308; McWilliams & Ritchey, Los Angeles, \$47,238; The Adams Co., Angels Camp, \$40,984; Rocca & Caletti, San Rafael, \$44,598; Leibert & Trobeck, San Francisco, \$46,598; M. B. Gowan, San Francisco, \$39,610; A. W. Kitchen, San Francisco, \$41,620; Butte Const. Co., San Francisco, \$44,426. Contract awarded to Healy-Tibbitts Co., San Francisco, \$37,705.

MENDOCINO COUNTY—Between McDonald and Navarro, 1.6 miles to be graded and surfaced with screened gravel, also timber bridges. Dist. IV, Rt. 48, Sec. A.B. & C. A. J. Grier, Oakland, \$101,533; Tieslau Bros., Berkeley, \$89,687; Smith Bros., Eureka, \$92,756; Healy-Tibbitts Const. Co., \$102,488; Marsh Bros. & Gardener, Inc., San Francisco, \$114,913; J. P. Holland, Inc., San Francisco, \$133,883; Deysher & Lafargue, San Anselmo, \$88,510; M. B. McGowan, San Francisco, \$87,554; A. W. Kitchen, San Francisco, \$91,683; Charles R. Perkins, Fort Bragg, \$88,209; T. E. Connolly, San Francisco, \$90,798. Contract awarded to W. C. Colley, Berkeley, \$84,791.

MONO COUNTY—At Hilton Creek, 1.6 miles grading. Dist. IX, Rt. 23, Sec. C. G. E. Finnell, Sacramento, \$30,949. Tom Meagher, Calexico, \$19,132; Wm. C. Colley, Berkeley, \$20,982; S. H. Palmer & Co., San Francisco, \$30,866; Lambert & Wood, Fresno, \$18,999. Contract awarded to D. C. Follis, Compton, \$14,689.

ORANGE COUNTY—At Irvine, 0.7 miles to be graded and paved with Portland cement concrete. Dist. VII, Rt. 2, Sec. B. C. G. Willis & Sons, Inc., Los Angeles, \$70,229; Griffith Co., Los Angeles, \$87,181; Sander Pearson, Santa Monica, \$87,670; Wells & Dressler, Santa Ana, \$74,979; George Herz Co., San Bernardino, \$91,086; Watson & Sutton, San Diego, \$96,383; B. W. Kahn Co., Los Angeles, \$90,178; C. T. Malcom, San Simeon, \$93,943; McCray Co., Los Angeles, \$79,631; Geo. Mitchell, Huntington Park, \$98,552; Martter & Bock, Los Angeles, \$79,228; Butterfield Const. Co., San Diego, \$83,096. Contract awarded to Steele Finley, Santa Ana, \$66,822.

PLACER COUNTY—Between Auburn and Colfax, 13.8 miles to be surfaced with bituminous macadam. Dist. III, Rt. 37, Sec. A.B. Fredrickson & Watson, Oakland, \$80,620; A. Teichert & Son, Sacramento, \$95,356; E. B. Skeels, Roseville, \$90,175; Heafey-

Moore Co., Oakland, \$81,922; J. A. Casson & Lee, Hayward, \$81,550. C. W. Wood, Stockton, \$74,270.

SACRAMENTO COUNTY—Between Ben Ali and Sylvan School, 8.7 miles grading and paving with Portland cement concrete. Dist. III, Rt. 3, Sec. B. Hanrahan Co., San Francisco, \$344,570; E. Paul Ford, San Diego, \$327,434; C. W. Wood, Stockton, \$329,030. Contract awarded to Fredrickson & Watson, Oakland, \$323,686.

SACRAMENTO-EL DORADO COUNTIES—Between Folsom and Placerville, 28.3 miles to be widened with oil treated rock borders. Dist. III, Rt. 11, Sec. A.B.C. Tiffany, McReynolds, Tiffany, San Jose, \$51,982; S. M. McGaw, Stockton, \$53,769; McGillivray Const. Co., Sacramento, \$71,240; Fred W. Nighbert, Bakersfield, \$55,959. Contract awarded to W. H. Larson, Sacramento, \$46,208.

SAN BERNARDINO COUNTY—Between Alray and Summit, 3.8 miles to be graded. Dist. VIII, Rt. 31, Sec. B. Isbell Const. Co., Carson City, Nevada, \$183,072; George Pollock, Sacramento, \$139,237; A. J. & J. L. Fairbanks, San Francisco, \$144,744; C. G. Willis & Son, Los Angeles, \$130,033; Nevada Contracting Co., Fallon, Nevada, \$170,885; J. M. De Luca, Oakland, \$218,255; M. S. Ross, Los Angeles, \$133,394; Martter & Bock, Los Angeles, \$128,452; Dimmitt & Taylor, Los Angeles, \$134,943; Schelling & Schelling, Burbank, \$139,650; Geo. Mitchell Co., Huntington Park, \$149,859; Twoby Brothers Co., & J. F. Shea Co., San Francisco, \$186,951; Sharp and Fellows Contracting Co., Los Angeles, \$172,389; John F. Collins, Stockton, \$161,684; Edson J. Davis, Venice, \$132,285; H. W. Rohl Co., Los Angeles, \$166,364; Wm. C. Horn Co., Puente, \$198,003; J. G. Donovan & Son, Los Angeles, \$142,065; Triangle Rock & Gravel Co., San Bernardino, \$127,896. Contract awarded to Gist & Bell, Arcadia, \$127,029.

SAN DIEGO COUNTY—Between La Posta Creek and Miller Creek, 4.5 miles to be graded. Dist. VII, Rt. 12, Sec. F. Isbell Const. Co., Carson City, Nevada, \$261,288; Nelson & Sloan, Chula Vista, \$322,300; C. G. Willis & Son, Inc., Los Angeles, \$276,369; M. S. Ross, Los Angeles, \$338,548; McWilliams & Ritchey, Los Angeles, \$297,625; Geo. Mitchell Co., Huntington Park, \$289,731; Twoby Bros. & J. F. Shea Co., San Francisco, \$346,438; Sharp & Fellows Const. Co., Los Angeles, \$400,439. Contract awarded to Nevada Constructing Co., Fallon, Nevada, \$233,658.

SANTA CLARA COUNTY—Between Sunnyvale and Santa Clara, 4.6 miles to be graded and paved with Portland cement concrete and asphalt concrete. Dist. IV, Rt. 2, Sec. A. Hanrahan Co., San Francisco, \$224,244; Peninsula Paving Co., San Francisco, \$232,387; John Jurkovich, Fresno, \$238,075; Prentiss Paving Co., San Jose, \$237,801. Contract awarded to N. M. Ball, Porterville, \$221,053.

SHASTA COUNTY—Producing and stockpiling 3000 cu. yd. crushed gravel between Shotgun Creek and northerly county boundary. Dist. II, Rt. 3, Sec. D. Contract awarded to Haidlen Const. Co., Lamoine, \$10,800.

SISKIYOU COUNTY—Between Shasta River and Gazelle, 7.7 miles to be graded and paved with Portland cement concrete. Dist. II, Rt. 3, Sec. B. Hanrahan Co., San Francisco, \$336,456; C. W. Wood, Stockton, \$337,404; Dunn & Baker, Klamath Falls, Oregon, \$311,557; Fredrickson & Watson, Oakland, \$310,436; Kaiser Paving Co., Oakland, \$323,147; T. E. Connolly, San Francisco, \$358,727. Contract awarded to T. M. Morgan Paving Co., Los Angeles, \$298,650.

SONOMA COUNTY—Between Fairville and Vineburg Junction, 7.3 miles to be surfaced with bituminous macadam. Dist. IV, Rt. 8, Sec. A.B. Heafey-Moore Co., Oakland, \$92,622. Contract awarded to A. Teichert & Son, Sacramento, \$82,316.

TRINITY AND SHASTA COUNTIES—Between Weaverille and Tower House, 22.1 miles crushed gravel or stone surfacing. Dist. II, Rt. 20, Sec. A.B. Newport Const. Co., Portland, Oregon, \$94,545; Deysher & La Fargue, San Anselmo, \$89,595; Hemstreet & Bell, Marysville, \$74,250; Chas. N. Chittenden, Napa, \$85,057; H. G. Johnson, Roseburg, Oregon, \$66,000; T. E. Connolly, San Francisco, \$96,294. Contract awarded to A. Milne, Portland, \$66,000.

TUOLUMNE COUNTY—Between Sonora and Sullivan Creek, 1.6 miles grading and oil treated surfacing. Dist. X, Rt. 13, Sec. C. Pacific Construction Co., San Francisco, \$50,711; A. J. Grier, Oakland, \$56,340; E. M. Spencer & M. J. Treaster, Sacramento, \$49,846; John F. Collins, Stockton, \$44,719; Tiffany, McReynolds, Tiffany, San Jose, \$46,805; Wm. C. Colley, Berkeley, \$46,276; The Adams Co., Angels Camp, \$45,610; R. N. Murdoch, Oakland, \$52,931. Contract awarded to Lilly-Willard & Blasotti, Stockton, \$44,075.

STATE HIGHWAYS IN CALIFORNIA SHOWING THE PRIMARY AND SECONDARY ROAD SYSTEMS AND THE DIVISION OF THE STATE UNDER THE BREED BILL.



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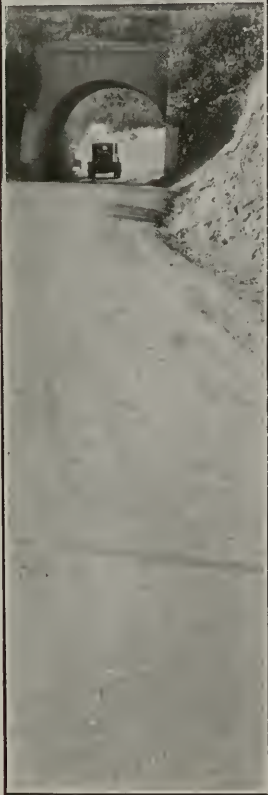


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Mr. Average Motorist, What Does State Highway System Cost You?

GOOD ROADS do not come high to the individual motorist in California. This is according to an article contained in the July issue of *AMERICAN HIGHWAYS*, in which a comparison is made of the cost to the individual motorist in the various states of automobile license and gasoline tax fees.

The figures are complete for the calendar year of 1928. They reveal some interesting facts.

California in that year ranked second among the states of the Union in the number of automobiles and trucks registered. The number was 1,799,880. Bearing this in mind it is interesting to note that the state ranked twelfth in auto license fees collected, receipts from this source totaling \$9,292,301.

* * * * *

The average motor license per car in California in 1928 was \$5.16. California ranked the lowest in the nation, in this imposition being listed as forty-eighth among the states. Arizona, with an average motor license fee of \$5.88, ranked next to California.

* * * * *

In its revenue from gasoline taxes, California topped the Union as far as total collections are concerned. First in total collections, however, it stood twenty-first among the states in the average gasoline tax imposed per motor vehicle. Total collections in 1928 in California from gasoline taxes were \$29,566,769, and the average gasoline tax per motor vehicle was \$16.42.

* * * * *

In the combined average of motor license and gasoline tax impositions, California ranked fortieth among the states. This combined average was \$21.58 per car. The only states with lower direct taxes on the motorist were: Indiana, \$20.54; Kansas, \$20.20; Nebraska, \$20.18; Colorado, \$20.04; Massachusetts, \$19.16 (no gasoline tax); North Dakota,

\$18.74; New York, \$16.46 (no gasoline tax); Illinois, \$10.31 (no gasoline tax).

A comparison of California collections with average collections for the United States is of interest. The figures are:

California	
Average motor license per vehicle	\$5 16
Average gasoline tax per motor vehicle	16 42
Average total	\$21 58

How much do the state highways of California cost you?

Are highway costs low or high as compared with similar costs in other states?

American Highways, in its last issue compiled statistics showing the relative cost to the average individual motorist of the state highway systems in the different states of the Union. This article gives the facts cited there concerning California's state highway costs. It should be noted that **American Highways** is the official journal of the **American Association of State Highway Officials**.

Average per state for United States	
Average motor license per vehicle	\$13 82
Average gasoline tax per motor vehicle	16 53
Average total	\$30 45
* * *	

It is the opinion of those who are now in charge of the administration of state highway affairs in California that the existing system of securing highway income is sufficient to care for the present needs of our state highways

and of those that can be reasonably anticipated for the future, PROVIDED that expenditures continued to be made as they are made now, viz:

- By budgeting funds in advance of their expenditure;
- By orderly disbursement of highway income in accordance with carefully considered programs covering a period of years;
- By progressive development of pavement types so that present improvements can be incorporated in future betterments without serious loss of the original investments.

If this policy continues to govern highway expenditures, California in the future should enjoy the advantage that it now possesses, namely, A VERY COMPLETE HIGHWAY SERVICE AT A RELATIVELY LOW COST.

* * * * *

While this is true, it must also be remembered that the adequacy of road income is determined by the necessity of traffic requirements.

Two Governors Join in Bridge Dedication

THE LATEST member of California's state highway bridge family was officially dedicated on Saturday, June 22, when the Hiouchi (Blue Water) bridge over the Smith River on the Redwood Highway in Del Norte County was thrown open to travel.

The occasion was notable inasmuch as it marked the completion of original construction throughout the length of the Redwood Highway, one of the great recreational highways of America.

Recognition of the importance of the completion of the bridge to the Pacific coast states was given by the presence at the dedication ceremonies of Governor C. C. Young of California, Governor Patterson of Oregon, and highway officials of California, Oregon and Washington.

Added interest was given to the completion of this bridge by the fact that just 100 years ago this same territory was explored by Jedediah Smith, who it is believed, gave his name to the Smith River. The route that it took months for the Jedediah Smith party to traverse is now traveled in a few hours' time. After months of unspeakable hardships, the Smith party was massacred in Oregon, but three members of the party escaping, among them Jedediah Smith.

The name, Hiouchi bridge, was selected for the structure by Mrs. Ralph W. Bull of Eureka, wife of the chairman of the California Highway Commission, upon the suggestion of women's clubs and civic organizations of Humboldt and Del Norte counties. It is an Indian term which, translated, means "Blue Water" and was applied to the Smith River because of the deep blue of the water of that stream.

The bridge is a through cantilever steel truss structures, with a main span of 380 feet and two anchorspans of 114 feet, making a total length of 608 feet. The roadway is 24 feet wide.

The contract price was \$170,470.50, of

which \$149,925 was for the bridge and \$20,554.50 was for approach grading and culverts.

The floor of the bridge is 58 feet above low water. The bottoms of piers are approximately 20 feet below low water founded on rock. The total height from bottom of pier to top of steel is approximately 114 feet.

The main span was erected by cantilevering out from the anchor arms and piers on each side of the river and so accurately was the designing and erection of steel work carried out that an adjustment of one-fourth inch was all that was necessary to drive the connecting rivets when the two arms met over the center of the river.

The contract was awarded April 17, 1928, and the contract date for completion was July 6, 1929. It was built by Parker-Schram Co.

The following account of the dedication ceremonies taken from the columns of the Humboldt Times of June 23d will be of interest:

Californians, Oregonians, Washingtonians, and residents of other states who attended the dedication of the Hiouchi bridge over the Smith river and the coast-wide highway celebration at that site yesterday, enthusiastically became willing workers for a greater and united Pacific coast as they attended the impressive ceremonies which symbolized the breaking

down of the last barrier on the Redwood Highway. More than a thousand persons, gathered from all parts of the United States and including the governors of two states and many other notables, assembled at the Hiouchi Bridge at noon yesterday and rejoiced at the completion of the last major project needed to make the Redwood Highway a first-class route from end to end.

BARRIER BROKEN

Following a short program of talks, the breaking down of the last barrier was symbolized by Governor C. C. Young of California and Governor I. L. Patterson of Oregon, who clasped hands and pledged cooperation between the two states as their automobile slowly broke through a barrier of greenery and ribbons strung across the bridge. The ceremony was completed by Mrs. Berenice Bull, wife of Ralph W. Bull, chairman of the State Highway Commission, who christened the bridge "Hiouchi," meaning "deep blue water," as she broke a bottle of Smith River water over the railing of the new structure.



Governors Young and Patterson.



Hiouchi Bridge Dedication Scenes



The pictures: Upper view, Highway Commissioners on the Hiouchi Bridge; left to right—J. P. Baumgartner, M. B. Harris, F. S. Moody and Ralph W. Bull. Center view—Governor Young of California and Governor Patterson of Oregon, formally opening the bridge. Lower view—The bridge itself. On the left is a photo of Director B. B. Meek, taken on the bridge, and on the right is the picture of Mrs. Ralph W. Bull, wife of the chairman of the Highway Commission, as she christened the bridge "Hiouchi" (Blue Water) with a bottle of water taken from the Smith River.

Bert B. Meek, State Director of Public Works, presided at the program.

"The completion of the Hiouchi Bridge marks the beginning of the end of Del Norte County's transportation problems," Thomas Peacock, Chairman of the Board of Supervisors of Del Norte County, informed those who had gathered at the bridge in his address of welcome.

Peacock also paid a glowing tribute to Ralph Bull and the other members of the highway commission.

"The dedication of the Hiouchi Bridge symbolized the elimination of the last stretch of the old one-way road on the Redwood Highway," Clyde Edmondson, Manager of the Redwood Empire Association and the next speaker, asserted.

Edmondson predicted a great and immediate increase in travel over the Redwood Highway and ex-

pressed the appreciation of the Redwood Empire Association for the work of Governor C. C. Young, Bert B. Meek, Ralph Bull and the Highway Commission in making possible the celebration.

Admiration for the beauty of the scenery through which the Redwood Highway runs, and congratulations on the opening of the Hionchi Bridge were expressed by Dr. L. I. Hewes, Deputy Chief Engineer of the United States Bureau of Public Roads.

Dr. Hewes also outlined the plan of federal aid for state roads, explaining that the federal road system now embraces 180,000 miles of highway upon which has been spent nearly a billion dollars.

ENTIRE NATION BENEFITS

"Sometimes I wonder whether we are aiding the states or whether the states are aiding the United States when we provide federal aid for roads," Dr. Hewes commented, "for the entire country benefits through good highways.

"Possibly the completion of the Hionchi Bridge influenced in some degree the decision of the Oregon State Highway Commission to make an announcement this week in Gold Bluff and Marshfield that we are preparing to build at once a bridge over the Rogue river on the Roosevelt Highway," H. B. Van Duzer, Chairman of the Oregon Highway Commission, told those gathered at the Hionchi Bridge yesterday. His announcement was greeted by enthusiastic applause.

Judge Robert W. Sawyer and C. E. Gates, members of the Oregon State Highway Commission, also were introduced and spoke briefly.

"At last we're on the map." So did Edward Morris, President of the Redwood Empire Association, express his pleasure at the dedication of the Hionchi Bridge and the completion of the Redwood Highway. Morris also expressed the thanks of the association for the work of Governor Young and the Highway Commission in making possible the removal of the last barrier.

In introducing Governor I. L. Patterson of Oregon, Bert B. Meek, Director of Public Works, warned the governor that California soon will have a couple of highways in this section that will make Oregon look to her laurels, in spite of the reputation for fine roads enjoyed by the northern commonwealth.

STATE LINES OBLITERATED

"Highways have obliterated state lines," Governor Patterson asserted. He called attention to the thousands of Oregon cars on California roads every year and to an equal number of California cars using Oregon highways, urging that the entire Pacific coast cooperate for the benefit of all.

The story of the discovery of the Smith River, on June 16, 1928, by Jedediah Strong Smith, also was related by Governor Patterson. One hundred and one years ago it took Smith a month to go from the Smith River in California, to the Umpqua River in Oregon, he pointed out. Nowadays, thanks to our fine highways, the distance can be covered in a few hours.

Governor Patterson also extended an invitation to all present to attend the dedication of the new bridge over the Rogue River, on the Roosevelt Highway, "within the next two years."

GLOWING TRIBUTE TO GOVERNOR YOUNG

In introducing Governor C. C. Young as the last speaker on the program, Meek paid a glowing tribute to the chief executive of the state as the man responsible for the completion of the Redwood Highway, through his efforts in obtaining the additional one cent gas tax for new construction work. He also characterized the governor as largely responsible for the removal

of the toll bridge menace to California highways as the result of a recent bill signed by Governor Young.

"Highways bring wealth and education to the people," Meek concluded, "and California highways are not imposing a burden on posterity."

CALIFORNIA TO HAVE HIGHWAYS SECOND TO NONE

"California is going to have a network of highways second to none in the world," Governor Young assured his audience. He had considerable praise also for the work of Meek and the members of the Highway Commission.

Congratulations were extended by California's governor to Oregon's chief executive on the splendid pioneering work done by Oregon in the establishing of good highways.

The occasion of the dedication of the Hionchi Bridge was a momentous one, Governor Young assured his listeners, because it signified the opening of a great new and beautiful territory. The Redwood Highway will become known all over the world, he predicted, and will aid in cementing a greater union between all parts of California and the Pacific coast.

The impressive ceremonies were held in a sort of natural amphitheater at the north end of the magnificent bridge. The weather was perfect with the blue sky above rivaling the deep blue water of the river in color while a golden sun beat down upon the celebrators.

Old Glory, nestling between two trees behind the speakers' sign, added the final touch of color to the beauty of the river, the sky, the forest and the mountains.

Among the more than a thousand participants in the celebration were, in addition to the two governors, state officials from Oregon and California, county supervisors and city officials from all parts of the Pacific coast, members of a party of metropolitan newspaper editors on an educational tour of the Redwood Empire, a group of San Francisco supervisors and their party, a party of distinguished foreign journalists on a friendship tour of the United States, chamber of commerce and Redwood Empire officials, Redwood Empire caravanners who will head northward from Grants Pass this morning, citizens of Crescent City en masse and hundreds of Del Norte, Humboldters and residents of southern Oregon.

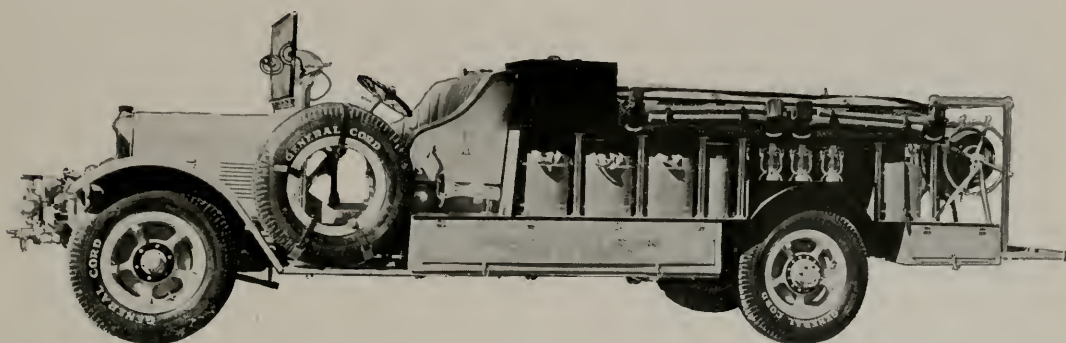
Following the dedication of the bridge the members of the official parties were guests of the Del Norte supervisors and the Crescent City Chamber of Commerce at a delicious chicken luncheon served in the forest at the south end of the bridge. Attractive Del Norte misses did the serving.

REDUCING NECESSITY FOR REPAIRS

Plans are under way for contracting the placing of bituminous blanket on a total of 30 miles of broken pavement at various locations along the state highway system. This will eliminate the constant patching operations on some of the older pavements and will provide a better riding surface, with less interference to travel as a result of the work.

MICHIGAN—The longest road survey ever undertaken by the highway department, begun in 1927 and now nearly completed, is for a 160-mile scenic shore road in northern Michigan, from Omer to Cheboygan.

Fire Engines for Field and Forest



THE NEW FIRE ENGINE.

THE ABOVE is a picture of one of Fox fire trucks designed and constructed at Headquarters Shop in Sacramento for the Division of Forestry.

These trucks are equipped especially for combating forest, grain and grass fires, although they can be used for any rural protection.

The apparatus is built on a two-ton truck chassis with compound transmission governed at a speed of 40 miles per hour. They carry a supply of 225 gallons of water in the truck tank. They also carry ten knapsack type pumps each having a five-gallon water capacity.

The truck is equipped with a high pressure fire pump driven by direct connection to the engine crankshaft through a clutch at the front end. The pump can be connected to city fire hydrants or water can be pumped from

streams, wells or any available supply. Four lines of hose can be used from each truck.

The hand equipment consists of shovels, brooms, rakes, hoes, axes, saws, sledges, falling wedges, and crow bars.

The general equipment consists of 2200 feet of hose of different sizes, six lanterns, field cooking kitchen for fifty men including plates, knives, forks and spoons, and cooking utensils.

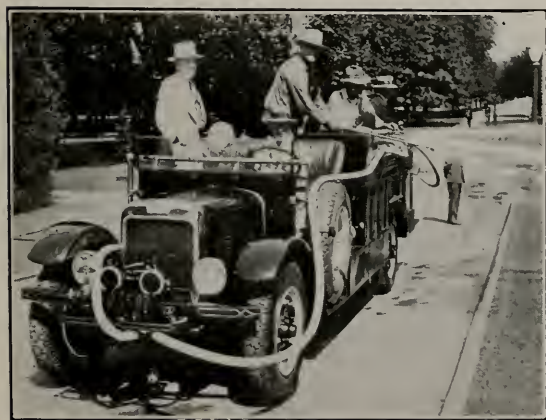
Provision has been made for carrying seven men on each truck conveniently, although more can be carried when necessary.

The trucks are being distributed to different districts of the state by the Division of Forestry, and are manned by state fire wardens.

The first truck was delivered July 2. The truck left Sacramento early on the morning of July 3, for a 180-mile run on its first fire, then burning at O'Neals in Madera County. When the truck arrived at the fire approximately 100,000 acres had been burned. This included grain fields, grazing land and brush, also two good sized wooden bridges. The fire was brought under control in about four hours after the truck arrived by the fire fighting crew and truck under the supervision of State Forest Ranger Wood.

At the time the truck arrived the fire was threatening valuable grain fields, also a large area of grazing land. At one time the fire jumped the line and was making good headway into a section of grazing land but due to the timely arrival of the truck, the blaze was extinguished in short order.

The truck was used on patrol duty all night, July 3, extinguishing small fires still burning, such as stumps, brush, et cetera, using the water in the truck tank and pumping from wells.



The fire engine in action: Equipment Engineer R. H. Stalnaker standing in front with Shop Superintendent Frank E. Burnside at the wheel.

Magnificent Highway Is Formally Opened



As the camera caught the scene when Governor Young opened the new highway.

AMID THE plaudits of thousands of cheering spectators, Governor C. C. Young formally opened the Santa Monica-Oxnard state highway to travel on Saturday, June 29.

The dedication of the highway with the long and colorful caravan of automobiles, led by a low flying Blimp, was an eventful day in state highway history. Widespread publicity was given to the dedication in the press throughout Southern California.

The magnificent new highway, its scenic setting along the sea, and the beaches and the cliffs that adorn it won the commendation of all both for the vision of those who had planned the highway and the genius of those who had built it.

GLAMOR OF HISTORIC PAST

To this was added the glamor of a most unusual and unique historic setting. This was well depicted by Beatrice E. Clark, writing in the *Pacific Palisadian*. In part the article follows:

This wonderland of the western sea first took its place in the known world on the seventh of October, 1542, when Juan Rodriguez Cabrillo, in quest of the fabled Strait of Anian and a direct route from Seville to the glamorous east; sailing in badly built, cockleshell boats, the *San Salvadore* and *Victoria*, manned with conscript crews; rounded a bold, rocky headline on the newly-named California coast. The beautiful sun-kissed crescent bay into which they sailed was the Bay of Santa Monica, which Cabrillo, seeing the smoke plumes ceaselessly rising from temescals of the Indians, named Smoky Bay. Linking the present with that far

NEW TRAVEL RECORD IS MADE ON NEW HIGHWAY

A new record for state highway travel was established in California on July 14th on the Santa Monica-Oxnard Highway. This road was thrown open to travel throughout its length on June 29th. A 16-hour count of travel passing over this road in both directions on July 14th, taken at Santa Monica Canyon, showed a total of 53,303 vehicles. On July 4, 1928, the portion of the road that had then been opened to travel showed a total of 43,173 vehicles, the count being taken at the same station.

An interesting feature revealed by the 1929 count was that with more than 10,000 more vehicles passing over the road than was the case on July 4, 1928, there was less actual delay and congestion of traffic this year, than a year ago. This was due to widening and oiling shoulders adjacent to the concrete pavement.

distant past are the heaps of arrowheads, vessels of stone and the bones of the Indians torn out by the hungry mouths of the steam shovels tearing down hillsides to make way for modern roadways.

The point rounded by Cabrillo as he sailed from the south was named centuries later by the English explorer, George Vancouver, on his second visit to the coast of California in 1793. Greatly admiring two Franciscan friars of the Mission San Buenaventura he named the first headland Point Vincenti and the north-



The Growth of the Highway



The pictures: (1) View showing the location of the highway before construction; (2) the same scene during construction; (3) as it appeared after completion of grading; (4) again after completion of grading.

ern outpost of the bay, 17 miles northwest, he called Point Dume. Stretching inland and north and south of Point Dume, lies the great tract of virgin territory in the same state as when Don Jose Tapia was granted a deed to the land by a Mexican governor in 1805. Known as the Topango Malibu Sequit, it included in its wide expanse three great canyons, Topango, Secas and Malibu. In 1824, so states the historian Luther Ingersoll, the rancho passed into the hands of Tapia's heirs, next changing hands to settle an unpaid grocery bill. Don Mateo Keller, who came into possession of the property through a tax sale, erected a large ranch house near the entrance of Malibu Canyon where he lived with his family, his son Henry later inheriting the land. He sold it in 1891 to the late Frederick Hastings Rindge.

DIFFICULTIES AND OBSTACLES CONQUERED

A picture of the difficulties encountered and the obstacles conquered in building the road is painted by J. C. More, office engineer in District Seven, with headquarters in Los Angeles. Writing in the same paper, Mr. More says:

The day labor job at Point Magu was the most difficult piece of work in this district. The solid rock bluffs to the water's edge made it necessary for surveyors and other workmen to be suspended by ropes like Alpine climbers, and the entire roadway had to be blasted out. The seven miles of heaviest work in this stretch cost nearly \$1,000,000.

The fact that there are no shipping points between Santa Monica and Oxnard made a long, expensive haul though no other difficulties of transportation were encountered. The shortage of water for construction work made it necessary for the state to lay a pipe line from the Los Angeles city limits at Castellammare to Nicholas Canyon, a distance of 21½ miles, carrying the city water for use at that point. Landslides also presented problems difficult to meet, one slide from the Ventura county bluff six weeks ago sending 100,000 yards of earth across the highway. The removal of this slide required a great amount of labor and engineering skill.

The coast formation is such that a special form of protection had to be evolved, one which it is believed, has never been used anywhere else. Owing to the impossibility of using the usual procedure in building seawalls where the waves beat upon the face of the rock cliffs, the system of concrete cells was devised whereby huge rectangular, hollow blocks of concrete, weighing three tons each were lowered into the ocean by cranes and when in position were filled with concrete, thus making a base for the sea wall. The great problem all along the coast line was to keep the fills in place and thousands of dollars were spent in building rip-rap and groins from Santa Monica on up.

GOVERNOR YOUNG SPEAKS

The importance of the highway to California was stressed by Governor Young in his dedicatory remarks. Speaking at a point on the highway midway between Santa Monica and Oxnard, Governor Young said in part:

Just stand by this road tomorrow and watch the traffic that it serves. Your hearts will swell with pride that your dream of 20 years has come true. This road is going to play a tremendous part in the development of this wonderful country.

We have already put in nearly \$5,000,000 in it and we find that it is only half wide enough. In a few years you will see it a highway twice as broad, carrying the heaviest traffic in the country between this point and the beautiful beaches about Los Angeles.

We have been enabled to do this by budgeting our highway expenditures, and building in a systematic order, as we are attempting to operate all departments of the state government.

BELIEVES IN THE PEOPLE

I was told when we started the system of budgeting the highway work and announcing our programs two years in advance that it was a serious political mistake; that communities that did not get what they were asking for would make us trouble. I said I did not believe it; that I believed the people of California wanted their money spent in a businesslike manner and that the day of political highway construction in California was past.

We began to announce our two-year program and we were commended instead of criticised, because we selected the work that was needed most and we divided the funds as equitably between all sections of the state as was possible.

It convinced me that if you go to the people of California, cards on the table, face up, and tell them what you are doing, if you are right they are going to be with you 100 per cent.

DIRECTOR MEEK'S ADDRESS

Mr. Meek, Director of the Department of Public Works, paid tribute to the foresight of the present State Highway Commission in selecting the Oxnard-Santa Monica highway for completion and in providing the funds, and also gave praise to District Engineer S. W. Cortelyou, who had immediate supervision of the work, and said that "California's splendid highway system is being built under the enthusiastic supervision of Governor Young and his highway commission."

The members of the state highway commission are here. That is the best indication of the interest the state is taking in your highways. This road was started ten years ago. It was through the gasoline tax that you gave us that we were enabled to finish it for you after we came into office three years ago.

With the gas tax, we can plan years ahead for our work and we can carry forward construction in an orderly manner and at a saving in cost to the taxpayers of California. Under our budget system, we are not only constructing highways already ordered or under way, but we can plan years ahead for the needs of the state in new highways and wider highways where the traffic requires it.

We used \$1,200,000 to complete the last 23-mile gap of this highway. My judgment is that the 44 miles of highway between here and the city limits of Santa Monica opens the most spectacular and beautiful area in America adjacent to a large population. The people of Oxnard and Ventura County can not realize in their wildest dreams the traffic this road is going to develop. These roads create their own values and justify the tremendous investment in their construction. Continue to give us the gas tax and California will have the greatest highway system of any commonwealth in the world.

(Continued on page 27.)

Building Safety Into State Highways

By B. B. MEEK, Director of the Department of Public Works.*

A FEW years ago when the volume of automobile traffic was but a fractional part of what it is now, and when the automobile was a slow-moving vehicle as compared with the car of today, the necessity of actually building safety into the highway and making safety an integral part of the road was not a particularly important part of highway construction.

Today the factor of safety in road construction is as important an element in planning a road as are any of the other features considered essential in highway design.

The necessity of safety in highway design is easily understood.

THIS IS THE PROBLEM

California law permits a driver of an automobile to travel, under favorable conditions, at a rate of 58½ feet a second. The automobile manufacturers and distributors have seen to it that a large portion of the machines on the highway are capable of traveling easily at the rate of 75 or even 90 feet a second. The hand and eye and mind of man can be coordinated by education to a marvelous degree but a 3000 pound automobile, traveling at a lawful speed of nearly 60 feet a second, or 40 miles an hour, is a force to be reckoned with at any time.

Multiply this by the hundreds of thousands of cars traveling our highways, each operating on its own schedule, coming and going, backing into and crossing traffic, as desire or necessity may dictate, and you have something of the picture of the problem that confronts the men who build and maintain highways, and those who seek to control their operation.

DRIVING CONSCIENCE GROWING

It is indeed deplorable that so many traffic accidents occur. But when one considers the

millions of people who daily trust themselves to this means of travel, it is to marvel at their faith in the men who build and maintain the roads. The extent to which accidents do not happen is due not alone to the increasing manner in which safety is being built into our highways, but also to the extent of popular education on motoring rules. Discouraging as statistics may sometimes appear the driving conscience of the thousands of motorists who make up highway traffic each year is being awakened to their responsibility. Education will be an ever-continuing part of the effort to reduce the accident hazard.

The men in executive control of highway work in California are seeking to justify the confidence of motorists by a forward looking policy, which will make safety an integral part of our highway system. We believe that there is no more ambitious program for safety design in highway construction

under way anywhere in the United States than that in California. The program does not stop with building safe highways, but extends to the maintenance and operation of highways, the control of traffic, and through cooperation with other agencies, to the education of the motoring public in the rules that they must observe and the practices that must follow, to protect themselves and their fellow travelers.

This article, however, will consider simply those safety measures which are considered as a part of the routine of design, location, construction and upkeep of our state highways.

SAFETY IN WIDTH

The adoption of the present financing program, based upon the one-cent gasoline tax for new construction, made possible with Governor Young's support, permitted a proper standard of design for construction. Proper

"The Division of Highways desires to cooperate with other state agencies, with the automobile associations and with all other organizations interested in safety measures to the end that the public may use their highways in SAFETY. Particularly it bespeaks the assistance and the cooperation of the individual motorist. The reckless motorist can make the safest highway dangerous; and conversely, the careful motorist will ride in safety over a highway that, judged by technical standards, might be considered unsafe.

"The best that the Division of Highways can do is to make the highway safe for the sane motorist. We are spending millions of dollars in doing this. But these expenditures and the months of effort spent in planning and building our highways can all be undone in the fraction of a second's time by the careless driver. I appeal to the individual motorist to do his part in this great work of making our highways safe by seeing to it that he drives in a safe and sane manner, with due consideration for the rights and the safety of other users of the highway."

* Reprinted from July issue of Motorland, official publication of the California State Automobile Association.

width of pavement is essential to safety. A turnpike road section capable of progressive development has been approved. On this section the minimum pavement width is 20 feet, made up of two 10-foot traffic lanes. The minimum width of roadway is 36 feet to provide an 8-foot shoulder on either side so that the motorist may park his machine entirely clear of the pavement. In general, a minimum of 100-foot width right of way is secured so that deep borrow pits may be eliminated. Fill slopes are kept flat so that if a vehicle is forced off the shoulder danger will be minimized. The planting of trees and placing of public utility lines are considered in their proper relation to safety.

GRADES AND CURVES

The maximum grade is fixed at 6 per cent and minimum curvature at 300-foot radius. Rolling grades, with sharp vertical curves of the sort which hide the oncoming car, are eliminated. Curves of less than 2000-foot radius are superelevated, and the crown in pavements is so slight as to be scarcely perceptible to a motorist. Bridges are designed with a roadway four feet wider than the pavement on either end so there will be no tendency for drivers to crowd toward the center as is the case on older, narrow structures. Provision is made also for future widening. Pipe culverts are extended so there is no constriction of the traveled way.

In locating a new road, consideration is given to limiting sections which will be shaded in wet or frosty weather so that the road will be as free from skidding hazard as possible. Short vertical curves and sharp curves at the foot of heavy grades are avoided. The safest alignment and least obstruction to vision is always given consideration. Many difficult problems in bridge design have been worked out in order to secure desirable alignment at approaches to such crossings.

ELIMINATING THE GRADE CROSSING

One of the outstanding planks in the highway safety program is the elimination of the railroad grade crossing, either by underpass or overpass structures, or by realignment. Twenty-six grade crossings have been eliminated in the present biennium, and the time is not far distant when the dangerous grade crossings on the state highway system will be a thing of the past.

Spectacular, however, as is the program for the abolition of the grade crossing, the fact should not be forgotten that it is only one of many features of the safety program now under way on California state highways.

Few people realize that even the best types

of pavement are, comparatively, only temporary. A surface which is safe when constructed, in a few years may become rough and uneven, causing a constant strain on vehicles and an added hazard in driving. Maintenance of a smooth pavement is therefore essential to safety.

Construction standards are at a high level. Specification requirements are primarily for the purpose of securing the most permanent, high class road of the type desired, but in holding to these standards greater safety is built into the highway. Fills are placed in rolled layers, adequate drainage is provided, and following the stage development of the surfacing, a heavy section of nonskid pavement is placed.

REBUILDING SAFER ROADS

In reconstruction work a great deal is done each year to make the highways safer. Horizontal curves are flattened and superelevated. Vertical curves are flattened. Shoulders are widened and rock placed adjacent to the narrow pavements.

Short sections of road which have proven hazardous, due to standard improvement on either end or for other reason, are being improved. Uniformity is a great aid to safety, as the average driver, who has been traveling at a high speed for a considerable distance, may not adjust himself quickly to changed conditions.

Guard rail, of 8x8 posts and of laminated rails built up from 2x8 planks, is installed on narrow grades, high fills and at bridge approaches. This guard is securely set and painted white. This type of rail is a decided improvement over the old standard, not only because of greater strength, but because the splintering of the old, light rail was a distinct hazard in itself, in case of accident.

The opportunity for initiating and carrying out safety measures in the maintenance work is apparent as there is a large mileage of the older types of construction and of unimproved county roads which have been taken into the state system.

STRIPING THE TRAFFIC LANES

The painting of stripes to divide pavement into traffic lanes has been initiated and some 1400 miles are programmed for such work during the coming biennium. This line not only increases safety but adds to the traffic capacity.

"School Slow" signs are kept painted on the pavement either side of all school buildings adjacent to the highways, to protect children who must cross roadways.

(Continued on page 29.)

San Fernando Pass, Historic and Forgotten

By BEN BLOW, Field Secretary, National Automobile Club

A FEW HUNDRED yards to the east of the State Highway, where traffic roars never ceasingly through the Newhall tunnel, is one of the most interesting and historical highway structures in California, the ancient San Fernando pass.

With walls that lift sheerly about 80 feet, just wide enough for one vehicle and approached from the south through a tortuous canyon over a 29 per cent grade, this old time highway entrance into southern California from the San Joaquin Valley supplied for many years the most direct access from north to south and, from the advent of the automobile until 1910 when Los Angeles County completed and opened up the Newhall tunnel for travel, early-day horseless carriages wheezed and rumbled and groaned over it mostly by mule power, for the early-day engines, one- or two-cylinder contraptions, invariably died on the hill.

Who was responsible for the San Fernando pass seems to be hidden in the unknown history of California, for neither the Los Angeles Public Library nor the State Library at Sacramento contains a single document which tells of its origin. Certain it is, however, that it was for a time a toll road. Pioneers who lived there in the old days and who still survive, gray and weather beaten, tell of a two-room adobe toll house which stood "on a little flat at the south entrance of the cut where an almond and an oak tree grew."

Today the walls of the toll house, beaten down by time into a mere outline of the old structure, may still be seen, while close at hand the oak tree flourishes still sturdy, and the almond, in the springtime, bravely blooms.

About the only mention of the San Fernando pass which California history affords, is supplied by the published diary of Bishop Kip, the first Episcopal bishop of California, who, on Monday, October 5, 1855, started on a trip from Los Angeles to Fort Tejon. Bishop Kip writes: "We left Los Angeles at 11 o'clock. Our vehicle was a large, heavy wagon, for no other is adapted to the mountain passes through which our road leads. We had hardly got out on the plains a couple of miles from Los Angeles—" between Los Angeles and the Hollywood of today—"when, in descending a gulch, part of the harness broke, the mules whirled around and we were only saved from an overturn by the snapping off



"The deep defile in the mountains," the old San Fernando Pass.

of the pole. Nothing could be done but for our driver to take a couple of mules, return to Los Angeles and have a new one made.

"After a wait of some hours we made a new setoff. We shortly passed through a chain of hills—" the Cahuenga pass—"and then again over the plains for seventeen miles. Not a living object was seen for hours, till toward evening the coyote wolves came out and we could see them loping along with their long gallop, often numbers in a troop." This was in the San Fernando Valley, where the "desert" now blossoms as a rose.

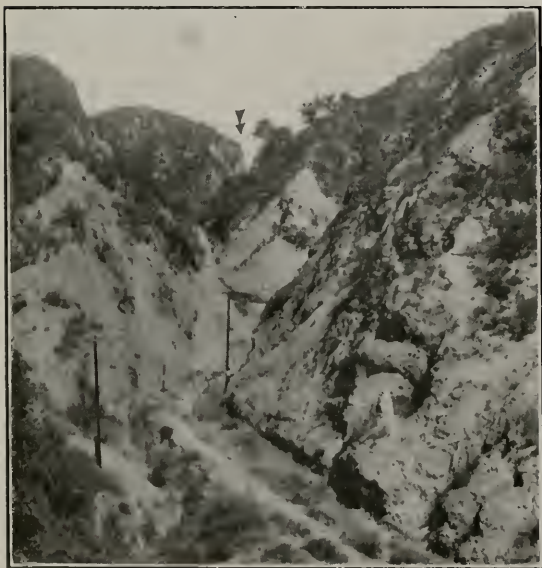
Stopping over night at the San Fernando mission Bishop Kip continues in his diary: "It was 7 o'clock before we left the mission, and, after proceeding a few miles, reached the San Fernando Pass where the road had been cut through a deep defile in the mountains. Here we had to get out and walk and the



Approach to San Fernando Pass from the south.

scenery was the wildest I have seen since I crossed the Alps. How our heavy wagon got over was a marvel to us."

With the opening of the Newhall tunnel in 1910 this "deep defile in the mountains" passed into history in so far as highway travel was concerned and remained wholly abandoned, almost forgotten, until the early-day movies found that it was an ideal location for western thrillers wherein chap clad cowboys leaped their horses across the narrow chasm or, single handed and alone, held the dark



Approach to San Fernando Pass as seen from the State Highway south of Newhall Tunnel showing a 29 per cent grade.

Highway Building Program is Driving Ahead of Schedule

All projects included in the state highway program for the biennium of July 1, 1927-June 30, 1929, have been placed under contract.

A total of \$5,000,000 of projects included in the program for the new biennium which began on July 1st of this year had been either placed under contract or were being advertised for bids prior to that date.

Minor projects involving a total of \$405,000 were transferred from the program of the 1927-1929 biennium to the present biennium because of right of way difficulties and engineering obstacles.

This is the substance of a report made by B. B. Meek, director of the Department of Public Works, to Governor Young and the members of the California Highway Commission.

The report shows that a total of \$14,461,957.15 was spent during this biennium on new

(Continued on page 30.)

depths against hordes of painted Indians or savage outlaws.

Scars on the sheer sides of the cut where this or that prop for picture filming was built into the scenery are all that remain to tell of its use in moving pictures and today, within sound of the whir of wheels humming over one of the most heavily traveled highways of California, the San Fernando Pass is scarcely known. Passing motorists north bound on the highway and approaching the south entrance of the Newhall tunnel may briefly glimpse in passing the V shaped cut in the skyline which marks its presence and occasionally, in the springtime, there will be comment on the lonely almond tree in bloom, but rarely does anyone stop to visit the somber depths of the old time pass.

On the very edge of one of the heaviest traffic flows in the state, this "deep defile in the mountains," with its steep approach lies undisturbed. Dark in its depths save for that brief noonday moment when the sun is at zenith it seems like some deserted and violated tomb, but viewed retrospectively through the eyes of imagination it unfolds a pageant of history wherein Indians and vaqueros, ox teams and pioneers, stage coaches and 49ers trailed in review by the one- and two-cylinder horseless carriages of the early motor era, pass on into the thin perspective of a forgotten day.

Read This "Routine" Report of an Explosion on Powder Truck Along State Highway

Colfax, Cal.,
June 27, 1929.

Mr. Chas. H. Whitmore,
District Engineer,
Sacramento, California.

Dear Sir: Attached are forms R-3 in duplicate to cover the accident near Baxter's Camp today.

The details of the case, as have been gathered from several sources, are as follows:

After leaving Auburn this morning, en route to Colfax, I recall passing this truck. After stopping for a time at the Colfax maintenance site, I again passed this truck above Colfax. Traffic Officer Marvin states that he particularly noted the care with which the driver crossed the railroad tracks at Colfax.

The truck was very heavily loaded. The mechanic at the garage at the top of Alta grade noticed that the truck was in low gear, and running very hot.

The driver stopped at Mrs. McKims for lunch about 11.30 a. m. and shortly after resumed his trip. At approximately 12.10 p.m. he passed our maintenance crew who were eating lunch. They were about one-fourth mile east of "Death Curve" above Baxter's. Those who were working on the patching crew at the time were: Foreman W. M. Barnes, I. R. Gamlin, D. O. Gamlin and S. R. Gamlin.

Of interest to Mr. George R. Winslow, is the fact that had he passed this spot about one or two minutes later, he would have found himself in a bad situation.

After passing the place where the boys were eating lunch, the truck entered upon a straight stretch of about 1000 to 1500 feet. While still on this stretch, the truck was suddenly enveloped in a cloud of smoke and flame. The sound of the firing of the powder

was quite loud, although it could not rightly be termed an explosion. The entire load was scattered over a radius of about 200 feet. The truck was a mass of flames and black smoke, as was the road for some distance surrounding the truck. The cans of black powder had flashed immediately. As there was no heavy detonation, the stick dynamite did not explode, but burned where it was thrown. Of the entire load, twenty of the boxes of dynamite did not burn. These were buried near the vicinity of the Division of Highways Maintenance crew.

As soon as the truck fired, our crew rushed to the spot. The intense heat kept them back some 200 feet. Nothing was heard from the driver, so it was not known for certain if he came to his death by suffocation or concussion.

Mr. W. M. Barnes took the situation in hand,

and managed it unusually well. He placed a flagman on the west side, and attempted to get around the fire to flag oncoming traffic. Before he could get around, a Yellowway stage nosed around the curve from the east, and stopped and the driver warned traffic from that direction.

The stage and passengers owes its good luck to a matter of about two minutes of time.

The fire spread to the surrounding country, and burned over several acres. The ranger was soon on the job, the station being but a couple of miles to the east. Our forces had the fire under control upon his arrival.

The Pacific Telephone and Telegraph Company's main lines were soon a mass of tangled wire, and service was crippled. A company maintenance man happened to be in the second car to approach the scene after the fire. The Auburn repair crew were notified and were on the job in record time.

The accompanying article is the verbatim report of Superintendent C. H. Weeks telling of an accident which occurred on the state highway on June 27th. In this accident, R. G. Case, a truckdriver employed by an Oakland concern, lost his life, while he was transporting powder from Oakland to a construction camp near Cisco.

Two or three perfunctory paragraphs in the newspapers covered the "story." We commend Superintendent Weeks' report to the press as a real "human interest" document.

Considerable trouble was encountered in handling the traveling public. After an hour of waiting, they became restless. The situation was still very dangerous, as burning dynamite was still strewn over the highway and roadsides. In clearing the road, considerable credit is due to Mr. W. M. Barnes and Mr. Glenn E. Sweeney for their carrying several boxes of *hot dynamite* from the road to a place where it could do no damage. This act should be worthy of some expression of appreciation.

Vague details of the accident reached Cisco where we were in the midst of a session of dust layer oil. This job was immediately tied up, and all men and equipment were rushed to the scene of the fire.

The patching crew had a full load of screenings on the truck at the time of the fire. This load was scattered over the burning pavement. After all burning powder was removed and the traveled way well screened, the traffic was allowed to proceed in safety. This was at about 2 o'clock.

A great deal of credit is due Foreman Barnes for the efficient manner in which he managed the whole situation. There were no traffic officers on the job until about 2 o'clock.

As the Division of Highways maintenance crew are always the first to arrive at these accidents, it is suggested that the idea might be advanced to Mr. Snook of the Division of Motor Vehicles, that one man of each of the maintenance crews be deputized to handle the traffic under just such conditions as this.

Very truly yours,

C. H. WEEKS,
Superintendent.

CONTRACTS ACCEPTED

The contract for grading and paving with Portland cement concrete 9.8 miles between El Centro and Brawley on the San Bernardino-El Centro road has been accepted. This work was done by the R. E. Hazard Contracting Company at an approximate cost of \$332,000. The work was completed a month ahead of the time specified in the contract.

The contract of George Herz and Company on the Mecca to Blythe Highway, between Hopkins Well and Black Butte in Riverside County, has also been accepted. This project involved 22.1 miles which were graded and surfaced with oil-treated crushed stone. The cost of the work was \$304,000. It was completed two months ahead of scheduled time.

The work of grading and paving with bitu-

GOVERNOR YOUNG WARNS AGAINST THROWING FIRE FROM MOVING VEHICLES

By C. C. YOUNG, Governor of California

I have requested traffic officers throughout California to rigidly enforce that section of the law that forbids the throwing of burning articles from a moving vehicle.

The strict enforcement of this provision of the law will be a very material factor in lessening fire danger along our highways.

The Division of Highways has spent large sums of money in burning the roadside along the state highway system where the fire hazard was considered particularly acute. This, however, only partially solves the problem. Great danger will always exist if fire is thrown from vehicles to light where chance or the wind may carry it. Proof of this is found in heavy losses already incurred through this source.

I would urge motorists to cooperate in this work by strict obedience to this very vital and important law. The public by a little care on the part of each individual can render unnecessary the unpleasant task of enforcing this law by means of arrest, fine and imprisonment.

We ask each motorist to police his own actions. If this is not done, do not censure the traffic officer for enforcing the law. He has received his instructions. If you will not obey the law, he must and will obey his instructions.

minous macadam on 2 miles at Bowman and Weimar in Placer County has been accepted as completed. Frederickson & Watson and Frederickson Bros., of Oakland was the contracting company. The cost of the work was \$54,500.

The contract of A. Teichert & Son, Inc., Sacramento, for grading and paving with bituminous macadam, between 1.7 miles west of Shandon and the easterly county boundary of San Luis Obispo County, a distance of about 15.4 miles, has been accepted as completed. The cost of the work was \$172,900. It was completed 11 days ahead of contract time.

The contract of H. H. Peterson, assigned to E. Paul Ford, for grading and paving with Portland cement concrete between Santa Rosa and Willowbrook in Sonoma County has been accepted as complete. The cost of the project was approximately \$430,000. The contract was completed 2½ months ahead of contract time.

ILLINOIS is to have a 3-cent gasoline tax beginning August 1. The revenue from this source is estimated at \$21,000,000 for the first year.

A Worthwhile District Organization

By L. B. REYNOLDS

THE NATURAL trend today, in both business and private life seems to be toward organization. Its purpose in the past has been to bring workmen together in a body to make working conditions better, but in later years the purpose has been broadened to include the improvement of mind and bring about business and social contact, thereby reaching the end that, in the past, was accomplished by mass strength.

Today we see luncheon and social clubs or organizations finding their way into towns very small in population whereby business and professional men have their weekly "Get Togethers." At these meetings competitors are brought together on



L. B. Reynolds.

more or less neutral ground where conditions are discussed and speakers of broader knowledge impart their learning to those not having had the opportunity to come into contact with these various subjects.

We now find that this same thought and desire has crept into the Engineering Department of District III, namely "District III Forum." The organization is not old but considerable has been accomplished since November 27, 1928, when the first meeting was held.

We can all feel deeply indebted to Mr. E. K. Guion, Office Engineer of District III, for its formation. It was upon his suggestion, during a "Get Together" meeting that the thought was brought to the attention of "The Boys." While associated with District I, Mr. Guion was responsible for the formation of a similar organization, the life of which was not long. Not to be discouraged he made the attempt again in our office, and it was readily accomplished.

Acting in the capacity of chairman at the first meeting, Mr. Guion gave the members a talk, covering the points in detail which he felt should be paramount, namely:

1. Organization.
2. Relationship between departmental heads and employees.

3. Educational.

- a. Promotion of public speaking.
- b. Lectures.
- c. Short study course.

4. Development of executive ability.

The late Theodore Roosevelt is quoted as saying "Each person, as a citizen, owes a part of this time toward the development of the home, the school, the church, the community, in which he lives, and also should devote a part of his time toward the advancement of that particular occupation or profession from which he makes his living."

It can be said that we are following a part of what Colonel Roosevelt said by the formation of this organization. We are devoting a portion of our time toward the advancement of the profession from which we make our living, even though it be in a minor way.

Our organization provides a means of bringing the members together for the exchanging of ideas, the betterment of methods that to a great extent are original ideas, thus making a tiresome task more interesting, and very often such modification is the means of making a costly job less costly. At the same time, young men entering the field of engineering are given the opportunity to acquire some of the knowledge from persons having reached a point above themselves.

Much more can be accomplished through the devoting of six or seven hours a month, at which time concentration on the subjects which come into our daily work, than can be gotten by many hours of reading articles that only touch upon the topics. This is said primarily for those new in the profession.

A contact with fellow workers is gained that is hard to accomplish. Many grievances that perhaps would result in enmity are overcome by the persons involved in seeing a character brought out in the others when their minds are relaxed and not carrying the burdens of their day's work.

A feature, hard to accomplish in any way other than through an organization such as we have, is the common footing upon which the department heads have placed themselves with the employees. Several instances can be cited where employees have presented ideas for the changing of routine or system to an extent that a great amount of repetition, such as is necessary in our work, has been eliminated.

(Continued on page 31.)

Clippings, Letters and Comment

1 1 1 1 1 1

THE HIGHEST bid in the history of the state highway system was submitted in July when bids were opened for grading and paving a nine-mile section between Hayward and Niles in Alameda County.

The bid of one contractor on this job was \$170,151,298.25.

When the bid was studied, to determine the reason of its gigantic proportions, it was found that the contractor had bid \$8,240 per cubic yard on unclassified excavation. Further study revealed that he had placed the total price desired for this work in the column designated in the bid sheet for the price per cubic yard.

In view of the fact that this one bid, if accepted, would have taken all state highway money for approximately six years, the bid was forthwith rejected.

The low bid on the job was that of Hanrahan Bros. of San Francisco, whose price was \$325,305.

* * * * *

The Service Honors The Whole Division.

LITTLE things are sometimes big things. Here is a letter that speaks a volume:

Los Angeles, July 18, 1929.

State Highway Commission,
Sacramento, California.
Gentlemen:

This may be a peculiar letter, but I feel quite strongly on the subject and that you ought to know of the situation.

There is a detour just south of the work now being done on "A" street, Ontario, which crosses the Southern Pacific tracks at grade, just east of Ontario.

A young man has been employed to serve as watchman of that crossing and signed the hours of 8 a.m. to 4 p.m. I have never talked with him, and my information is from an outside source. I do not even know his name.

An eastbound S. P. passenger train is due at 4:45 p.m. This is forty-five minutes after your watchman is off duty, but there is more traffic over the detour about that time than any other portion of the day. The young man stays, therefore, until after this train has gone before he leaves.

It is altogether too seldom that an employee of the state, or, for that matter, of an individual employer, is imbued with the sense of his responsibility to the people. This is an outstanding case and I am glad to call it to your attention.

Sincerely,

(Signed) C. H. MEADOR.

Mr. Purcell Returns From Boise Conference.

C. H. PURCELL, State Highway Engineer, returned on July 15, from the annual meeting of the Western Association of State Highway Officials, held in Boise, Idaho.

The association passed a resolution asking that the U. S. government remove the limit of \$15,000 a mile now placed on federal contributions to highways in the Federal Aid system. The resolution declares that the \$15,000 limit was fixed in 1922, when construction standards were much lower than they now are. This restriction, the resolution further declares, throws an unfair burden on the state.

The Colton-Oddie bill was endorsed. Under this bill the U. S. would increase its appropriation of forest highway funds from \$7,500,000 to \$12,500,000 for each year. An appropriation of from \$3,500,000 to \$5,000,000 would also be made for roads passing through unappropriated public land, withdrawn from state taxation, excepting national forests which are otherwise provided for.

An aviation conference was held just prior to the road meeting. A resolution was passed at this former conference asking that each of the governors of the eleven western states appoint a contact man or contact board, the whole to make up an aeronautical board for the western states, to which board all interstate aviation matters would be referred. The object of this board would be to secure uniformity of legislation on interstate aviation matters and to promote more effective cooperation in these matters between the states and the U. S. Department of Commerce.

* * * * *

Highway Crews Win Commendation.

J. E. ELLIOTT, forest supervisor, has written State Highway Engineer C. H. Purcell, the following letter commending roadside fire protection, conducted in San Bernardino County by District Engineer Sullivan and his forces:

"Please permit me to congratulate your department for the excellent work being done in fireproofing the Waterman Canyon road. The work you are having done will no doubt greatly lessen the risk of fire starting in this canyon and we want you to know

that the Forest Service fully appreciates your splendid cooperation."

* * * * *

**National Standowners
To "Chain" Hot Dogs.**

A NEW development in the roadside refreshment industry is the organization of the National Standowners' Association, a trade group, adequately financed, which proposes to introduce chain store methods to the "hot dog" stands.

* * * * *

**Strong Commendation
From Director Heron.**

A PROPOS of fire protection work, under date of July 18th, Alexander Heron, Director of Finance, wrote the following letter to Mr. B. B. Meek, Director of Public Works:

"It was my privilege yesterday to inspect and witness in operation one of the new fire trucks which are being used to stamp out fire in the forest regions. It was revelation, indeed, to see this truck in operation, and I want at this time to congratulate you and your department on the assembling of such an efficient unit. I am sure it will do much in coping with the serious situation which confronts the forest rangers from year to year."

* * * * *

**Supervisors of San Luis
Obispo County Give Praise.**

APPRECIATION of the services of Governor C. C. Young, B. B. Meek, Director of Public Works for California, and the State Highway Commission has been officially expressed by the board of supervisors of San Luis Obispo County.

A resolution, presented to the board by Chris N. Jespersen, assemblyman from this district, was unanimously approved by the board.

The resolution follows:

Whereas, the welfare of San Luis Obispo County requires the development of and careful consideration for the National Guard Training Camp, the California Polytechnic School, and our highway system and

Whereas, Governor C. C. Young, Director of Public Works, Bert Meek and the State Highway Commission, together with its staff and engineers including Divisional Engineer Lester Gibson, located at San Luis Obispo, have shown at all times a proper appreciation of and keen interest in the problems of our county and the best interests of our training camp, Polytechnic School, and that part of the state highway system within San Luis Obispo County, and

Whereas, this appreciation and interest has been typical of the appreciation and interest of these men in the affairs of this state and every community therein; and has earned for them the commendation of the people of this state; now therefore

Be It Resolved, that we the Board of Supervisors of San Luis Obispo County do hereby commend Governor C. C. Young, Director of Public Works, B. B. Meek, the State Highway Commission, its staff and engineers, for their high standard of public service as exemplified by the manner in which they have performed their various duties and especially for the consideration they have given the affairs of our county.

Be It Resolved, that a copy of this resolution be spread on the minutes of this board, a copy be sent to Hon. C. C. Young, Governor of California, a copy to the Hon. Ralph Bull, Chairman of the Highway Commission, a copy to B. B. Meek, Director of Public Works.

* * * * *

**"Road Builders Unsung
Heroes of Perilous Job."**

THE SAN FRANCISCO *Examiner* editorializes under the heading quoted above as follows:

Road building calls for the willingness to risk one's life and limb, something motorists fail to realize when they travel serenely over the smooth ribbons of highway now found everywhere.

Consider, for example, the case of Grant Merrill, a maintenance superintendent for the State Highway Department. He was making tests recently of the snow in the High Sierra preparatory to instructing his crews in its removal.

A powder cartridge he was using to test the depth and condition of the snow exploded prematurely and blew off his arm.

He might just as well have had one of his laborers use this dangerous explosive and have saved himself, but the road service has built up a tradition for quiet courage just as great as those more picturesque arms of government which the movies enjoy depicting.

It has proved itself in time of flood and in invading danger spots to repair, sometimes at great hazard, the ravages of storms.

The mountain road which the unthinking complain of as narrow and inadequate was built by these men hanging high above a gorge on road equipment not as easily handled as a motor car.

And, though their courage goes unsung, their ranks contain many Grant Merrills, superintendents who do the dangerous work themselves.

* * * * *

**Contractors Give
Loyal Cooperation.**

THE CONTRACTORS of California will do everything in their power through the distribution of state highway money to alleviate the damage caused in many parts of California through the heavy frost of last spring.

This is the substance of a large number of replies received by the Division of Highways in response to its request that contractors awarded state highway work employ, as far as it is possible for them so to do, local labor on their contract and purchase supplies from local merchants. A letter containing this request has been included with every contract signed

by Director Meek within the past four months. In this letter Mr. Meek calls attention to the desirability of compensating to some extent for frost losses through distribution to local labor and local merchants of expenditures upon state highway projects in their vicinity.

The response of the contractors has been gratifying. A number of letters have informed Mr. Meek that the policy outlined in his letter had already been put into force. Other letters applaud the soundness and desirability of the plan.

* * * * *

Unique Highway Planting Plan Is Proposed.

PLANS FOR sensational adornment of desert stretches of the highway, east of Banning, have been presented to the Redlands Chamber of Commerce. A suggestion came from E. A. Bayley, assistant engineer of the Los Angeles bureau of water and power, that borders of ocotillos be planted along the highway.

Mr. Bayley gave the chamber of commerce a mental picture of a million long, upright lances, all flaunting scarlet pennants at their tips. Their color would suggest California to the motorists. Mr. Bayley would arrange the ocotillos in double rank over nearly 100 miles of the shimmering desert between Mecca and Blythe.

This, he declares would make the road the most colorful drive in the world. It would be unique, he says, among 6,500,000 miles of highways criss-crossing the globe, and an extraordinary tourist attraction.

* * * * *

Grange Is Pleased With New Bridge.

The following resolution has been received from Silverado Grange at Calistoga, Napa County:

Whereas, The California State Highway Commission has just completed the construction of a concrete bridge on the State Highway, about two miles north of Calistoga, on the main highway between Calistoga and Middletown, and thereby eliminating a dangerous curve and bridge, that previously existed at this location; and

Whereas, The board of supervisors of Napa County gave their support to this undertaking by securing the necessary right of way for the new alignment; therefore be it

Resolved, That Silverado Grange in regular meeting assembled the twentieth day of July, 1929, do hereby thank and commend the California State Highway Commission for this new improvement, and the board of supervisors of Napa County, for their cooperation.

Highway Builders Assist State In Quarantine Work

The following letter of appreciation has been received from G. H. Hecke, Director of Agriculture:

Sacramento, Cal., July 15, 1929.

Mr. B. B. Meek, Director,
State Department of Public Works,
Sacramento, California.

Dear Mr. Meek: It was my intention to have written you sooner in appreciation of the excellent cooperation we have received from your men in different sections of the state relative to the construction of our border quarantine stations. Mr. Norman Underwood, who is a superintendent in Division No. 1 at Crescent City, very courteously and energetically assisted in the establishment of our station there within the very shortest possible time; also the work that was done under the instruction of District Engineer. Mr. Comly, in connection with our Hornbrook station, was handled most effectively.

In a letter of June 7 from Mr. Dennis, he advises that an estimate is to be secured in connection with grading and crushed rock work at our Truckee station. This will add materially to the value of the station there, and the Department of Agriculture will gladly pay whatever the necessary charges are.

I assure you that I appreciate the assistance the various men in your department have given us.

Very sincerely yours,

G. H. HECKE,
Director of Agriculture.

MR. AVERAGE MOTORIST, WHAT DOES STATE HIGHWAY SYSTEM COST YOU?

(Continued from page 1.)

Accordingly the need for income in California today must be judged by the highway standards of the present, and not those of years ago.

Judged by these standards, the opinion, entertained by many, that California today has a surplus of state highway revenue is emphatically not true. Present income is adequate if spent in an orderly and economical manner, but it is not excessive.

It is no more possible for California to operate in 1929 under the revenues of 1912 than it would be to build the pavements under the standards of construction that prevailed then.

A little fellow of our acquaintance wants to know why vitamins were put in spinach and cod-liver oil instead of in cake and candy.—*Boston Transcript*.

Special Highway Study Launched

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THE MOTORING public is now having the opportunity of becoming acquainted with the special traffic checking crew of the Division of Highways. A three-man party started out July 10th to collect traffic information on the various roads which are to be considered in connection with recommendations to be made by the Highway Commission to the state legislature as required by concurrent resolution of that body.

In order to ascertain if the traffic is "local," "intercounty" or "through" it is necessary to stop each vehicle which passes any given station. "Through" traffic is defined as traffic which originates or terminates on a state highway, regardless of the distance traveled. "Intercounty" use is necessary to determine the extent of joint use of a road common to two or more counties. "Local" traffic is that which originates on the particular road or from roads immediately tributary to it.

Five informational counts in all are to be made. These counts will be for eight-hour periods and at various hours of the day. At least one count will be a night count.

Several density counts will be made at these and other stations during the year, but these counts will not interfere with or delay traffic. The volume and type of traffic is to be recorded during the density counts.

The resolution of the legislature directed the study, of which the traffic count is a part, to determine:

(1) Roads not now in the state highway system, which, in the opinion of the California Highway Commission and the Department of Public Works, should properly be included in it;

(2) The extent to which there is a lack of balance which prevents a well-ordered and unified system, and the manner in which such lack of balance may be corrected;

(3) A study of the state highway system, which will give information regarding the cost of bringing the system up to a stage where traffic on our highways is adequately and economically served;

(4) The extent to which highways may be added in the next two years to the state system without unduly jeopardizing existing and future maintenance and construction funds; and

(5) Some method by which these maintenance and construction funds may as soon as possible be made available for the new roads that may be added to the state system.

Other provisions contained in the legislative resolution are:

Additions shall during the next two years be made to the present secondary highway system, totaling between 10 and 12 per cent of existing state highway mileage, said mileage to be added in the ratio of not less than three or four miles in the south to one mile in the north.

Under this provision it is intended to progressively correct the present disparity in secondary highway mileage between the northern and southern counties. In his message to the legislature, Governor Young commented as follows on this phase of the highway problem:

"The present highway system as built up during previous administrations included only 525 miles of secondary roads in the southern counties as against 1778 miles in the north. This means that whereas the north has 1778 miles over which to spread its allotment of secondary highway funds, the south has only 525 miles on which to use an equal allotment, thus requiring that, until this lack of balance is adjusted by taking in other roads which may qualify for a place in the state system, there must be an uneven development of the secondary system in the two ends of the state.

"No one, I am sure, would wish to disturb the equal allotment of funds to northern and to southern secondary roads. It is obvious, therefore, that an unsatisfactory condition will exist until the present great disparity in secondary mileage is reduced. The Highway Commission assures me that on the basis of preliminary investigations it is also obvious that, in the 10 to 12 per cent increase referred to above, they must of necessity recommend the addition of three or four times as much mileage in the south as in the north. This addition will be confined to the secondary system and by so doing it will more nearly equalize the secondary mileage in the state."

Other provisions of the resolution provide that there shall be no change in the present statutory division of secondary highway funds.

A Tribute to the Highway Engineer

[From the BUILDING AND ENGINEERING NEWS, San Francisco]

Back on the job after two weeks out in the great open spaces.

Up the Redwood Highway—along a bit of the Columbia River Highway in Oregon—thence a return trip to the land of “Sunshine, Fruit and Flowers” via the Pacific Highway into the world famous Yosemite National Park.

God bless the highway engineer and the fellows who follow in his path in the construction of roads and bridges that permit you and I to travel from the four corners of this great United States to any metropolitan city, town or hamlet we desire to reach.

Words fail me in my desire to pay tribute to the highway engineer. A noble profession.

Motor up the Redwood Highway through Marin, Sonoma, Mendocino, Humboldt and Del Norte counties into Grants Pass, Ore. A ribbon of roadway surpassing any you have yet driven over. See agricultural activities at their best—cattle—timber, Redwoods and more Redwoods—the Eel River—and—at the end of your journey in Del Norte County view the Pacific Ocean with its jagged edge at Trinidad—“the fisherman’s paradise.” A wonderful trip. Thanks to the highway engineer.

Make the return trip on the Pacific Highway. Circling the Siskiyou Mountains, a second-to-none highway. Zigzag, bow-knot and curl over this roadway. See the timbered mountains. There just ahead, then on the right, then left and again in the rear you have towering Mount Shasta with its snowy peak looming above like a huge cake covered with frosting. A wonderful drive is the Pacific Highway. Thanks to the highway engineer.

Continuing on we cut across valley and mountain, river and creek, headed for the Yosemite Valley.

Leaving Merced we motor over the All-Year Highway into the valley.

This roadway is a monument to convict labor working under the supervision of the State Highway Commission. For this highway, running along the Merced River for miles, we owe another debt to the highway engineer.

Enter the Yosemite Valley. Truly God’s masterpiece in California. On the left the restless Merced River fast flowing to keep ahead of its seemingly never ending end

thundering down the many falls throughout the valley.

Look here on the left and see El Capitan, that huge stone mountain which commands your attention upon entry and departure from the valley. Pass the lodge and view Yosemite Falls. Continuing on look above and see North Dome and just ahead the closing section of the valley. On the right higher up you see Half Dome, another mountain of rock, then just a bit to the right again you have Glacier Point and farther on Bridal Veil Falls, the Cathedral Spires and the Three Brothers.

Again thanks to the highway engineer. Good roads lead into Yosemite Valley. Roads that traverse through and around beautiful country.

“See America First” is a good slogan.

However, “See California First via State Highways” is a better one.

In paying tribute to the highway engineer the writer does not seek to belittle the highway contractor for his part in making California’s wonderful highway system. The writer pays tribute to the man who “created” the system, not to the man who follows with blueprints, machinery, rock, steel, cement and other materials.

The highway engineer goes first. A big city, a barren valley, a mountain or a body of water is before him. He must lay out the line. He must lay out the best route to permit traffic to proceed with speed and safety. He must lay out the most economical route, for highways cost money. From his survey figures the road is created on blueprints. Nothing remains but for the contractor to read the prints, assemble materials and equipment and complete the project.

In the past I considered the architect as the great “Creator” on earth. Today we view a vacant lot in the downtown section. Six months from now on that same lot we view a towering skyscraper. From blueprints of the architect the structure was “created” with a quantity of rock, sand, steel, lumber, cement, etc.

The architect has his site located, knows the exact amount of money his client desires to put into his structure and proceeds with his ideas to “create.” His “creation” takes effect in a modern office.

God bless the highway engineer. And now, vacation is over. Back to work.

Road Improvements Secured Through New Contracts Awarded During Month

The following summary shows the awards of contracts from June 25 to July 25, the sections to be improved under these contracts, and the character of their improvement. In accordance with the policy of the Division of Highways, the award of contracts is timed to take advantage of favorable climatic conditions for road building. Thus winter work is largely concentrated in southern California and summer work in the northern part of the state.

Will Stop Road Flooding.

W. J. Nethery and Son, Riverside.—Two reinforced concrete bridges, one across San Antonio Creek at Pomona and one across Collins Creek about 4 miles east of Ontario, both on the state highway extending from west of Claremont to Riverside. These bridges are being constructed on the existing highway to eliminate a bad condition due to the flooding of the road at these points at times of excessive rainpour. The plans call for three 27-foot reinforced concrete girder spans and three 14-foot reinforced concrete slab spans with approaches graded and paved to both bridges; contract price \$33,170.65.

Eliminates Dangerous Bridge.

Bodenhammer Construction Company, San Diego.—A concrete reinforced girder bridge across Cottonwood Creek in Tehama and Shasta counties, consisting of twenty 60-foot spans on concrete piers. This new bridge is being built on improved alignment which eliminates the present crooked county road and an old dilapidated bridge. It provides a longfelt need on this highway, as it was considered the worst portion of the Pacific Highway between Sacramento and Redding. Contract price, \$159,827.

Widens Road, Betters Crossing.

Valley Paving and Construction Company, Visalia.—Grading and paving with Portland cement concrete a section of the Valley Highway, 4.1 miles long, between Berenda crossing and Califa in Madera County. This improvement will replace the present road which consists of a 15-foot concrete pavement lying east of the railroad between Califa and Berenda. The new road is on the west side of the railroad and will cross the railroad near Califa at a grade separation structure to be built under another contract. The new road will eliminate the crossing at Berenda by making the crossing at Califa, which is also the junction with State Highway Rt. 32 (Pacheco Pass), thus providing one crossing to serve traffic on both routes. Contract price, \$164,511.10.

Replaces Narrow Bridge.

Ben C. Gerwick, Inc., San Francisco.—Bridge across Salinas River at San Ardo, consisting of ten 100-foot steel deck truss spans and seventeen 37-foot reinforced concrete girder spans. This structure will replace the present bridge which is only 15 feet wide and as built by Monterey County in 1907. It is in poor condition, and by reason of its location on the Coast Highway is subject to a large amount of traffic at all times of the year. Contract price, \$233,107.

Surfaces Highway.

Montfort and Armstrong, Sacramento.—Three-mile section to be graded and surfaced with untreated crushed gravel or stone between McGee Creek and

Convict Creek in Mono County, on the Bishop-Bridgeport road. The roadbed is to be graded to a width of 24 feet with surfacing 20 feet wide.

One-Way Road Replaced.

Camino Construction Company, Palo Alto.—Reinforced concrete bridge 40 feet long over Markleeville Creek in Alpine County and constructing a graded roadbed 24 feet wide with surfacing 20 feet wide and 8 inches thick of untreated crushed gravel or stone. This project constitutes a new road alignment and a relocation of the bridge across Markleeville Creek, replacing the present one-way crooked road and an old bridge. Contract price \$17,536.

Eliminates Narrow Trestle.

Larsen Brothers, Sonoma.—Constructing a graded roadbed 36 feet wide and placing gravel or stone surfacing 20 feet wide from Arno to McConnell Station in Sacramento County on the Valley Highway. This project is a link in the main traveled highway between Los Angeles and Sacramento via Stockton and is known locally as the Upper Stockton Road. There is a heavy traffic over it. Bridges across the Cosumnes River and overflow are being built under another contract. This improvement will eliminate the present narrow trestles across the Cosumnes River overflow. The crushed gravel or stone surfacing will serve traffic for a year while the fills are settling and will provide a base for the pavement to be placed next year. Contract price, \$57,098.50.

Widen Bridge, Better Alignment.

W. L. Proctor, Santa Rosa.—Bridge across Novato Creek, one mile south of Novato in Marin County on the Redwood Highway. The new bridge will replace a present narrow bridge and will be built on an improved alignment. The structure will consist of four 34-foot reinforced concrete girder spans on pile bents. Contract price, \$27,961.

Corrects High Crown on Narrow Fill.

C. W. Wood, Stockton.—Three and one-tenth mile section to be graded and paved with Portland cement concrete between Banta and the San Joaquin River in San Joaquin County. This section is a part of the highway locally known as the "West Side Road" or "Tracy Highway." It carries a heavy traffic from Oakland and San Jose to Stockton. The improvement will eliminate the present high crown pavement on the narrow fill. The roadbed is to be graded 36 feet wide with a Portland cement concrete pavement 20 feet wide. Contract price, \$141,525.24.

Steep Grades Overcome.

T. E. Connolly, San Francisco.—Nine and three-tenths miles to be graded between Airport and Indian Springs in Placer and Nevada counties on the Victory

Highway. This new section will eliminate the steep and dangerous hill at Crystal Lake. Two railroad separation structures are to be built under separate contracts, which will eliminate the present dangerous crossing through the snowsheds at Immigrant Gap and Crystal Springs; roadbed to be graded 28 feet wide. Contract price, \$396,385.

Widens Highway.

Hanrahan Construction Company, San Francisco.—Grading and paving 8.7 miles between Hayward and Niles in Alameda County. The project calls for constructing a graded roadbed 47 feet wide and placing Portland cement concrete and asphaltic concrete pavement to a width of 20 feet. This section is a part of one of the two main arteries extending south from the East Bay cities. It carries a very heavy traffic. The present 18-foot pavement is too narrow to serve this traffic. The underpass at Niles is to be improved by building a new underpass for pedestrians and using the space of present sidewalk for an increased road width. Contract price, \$325,305.85.

Replaces Inadequate Bridges.

M. B. McGowan, San Francisco.—Construction of a reinforced concrete bridge, consisting of two 47-foot 6-inch spans and three 60-foot spans with 24-foot roadway, across Shasta River in Siskiyou County on the Pacific Highway. This project is about 5 miles north of Yreka. This is one of three bridges to be built in Shasta Canyon on new alignment on this route, replacing present inadequate bridges. Contract price, \$29,411.25.

San Anselmo Pavement.

A. G. Raisch, San Francisco.—Paving 0.6 mile with asphaltic concrete through San Anselmo in Marin County. Contract price, \$10,417.

Timber Bridges.

M. J. Bevanda, Stockton.—Construction of timber bridges and approaches at Yerba Buena Creek in San Luis Obispo County. Contract price, \$9,608.30.

Cement Bridge.

William Lane, Paso Robles.—Construction of a reinforced concrete bridge over Graves Creek in San Luis Obispo County. Contract price, \$10,977.50.

Better Cosumnes Bridge.

Griffith-Hunter Company, Sacramento.—Bridge across Cosumnes River and overflow channels in Sacramento County on "Upper Stockton Road." The contract calls for the construction of a bridge consisting of four 54-foot reinforced concrete girder spans on concrete piers and 437 feet of timber trestle approaches on pile bents across the main channel, and two bridges across overflow channels, one consisting of 285 feet of timber trestle and the other 836 feet of such trestle. This project is a part of the main valley route from Sacramento to Los Angeles and carries a heavy traffic. The present structure which will be replaced consists of a steel bridge across the main channels and wooden trestles across the overflow, all in poor condition. Contract price, \$126,850.50.

Safer Crossing.

Peninsula Paving Company, San Francisco.—Grading and paving 10.3 miles between Chualar and Salinas in Monterey County on the Coast Highway. The roadbed is to be graded to a width of 36 feet and an asphaltic concrete pavement laid 20 feet in width. The alignment of this section has been revised to eliminate

the right-angle turns at the railroad crossing at Spence, at which point an underpass will be built under another contract. Contract price, \$236,484.85.

Improved Alignment.

George J. Ulrich Construction Company, Modesto.—Bridge across Arcade Creek in Sacramento County on the Auburn Boulevard. This bridge is being built on improved alignment and will replace the present narrow bridge and its dangerous approaches. Contract price, \$13,131.50.

Stockpiling Material.

Hein Brothers and Chittenden, Napa.—Placing and stockpiling crushed rock surfacing on the existing roadbed at different locations from Susanville to a point 2 miles west of Milford in Lassen County on the Lassen Boulevard. This project will enable economical operation of this section of highway upon which traffic has increased heavily since the improvement east of Susanville. Contract price, \$38,536.90.

Last Gap Improved.

Deveri and Company, and J. A. Maddox, Klamath Falls.—Constructing a graded roadbed 56 feet and 24 feet wide and placing crushed rock surfacing 20 feet wide from Goodrich to Coppervale in Lassen County, on the Red Bluff-Susanville Highway, a distance of 4.38 miles. This is the only remaining gap on this road, other portions being either improved or under construction. Contract price, \$68,212.20.

Bettters Surface.

Jack Casson, Hayward.—Placing on existing surface a bituminous surface treatment consisting of screenings and asphaltic road oil, extending 14.5 miles from the Klamath River to the Oregon line in Siskiyou County on the Pacific Highway. Contract price, \$17,876.50.

Pacific Highway Bridge.

Carlson Brothers, Turlock.—Reinforced concrete girder bridge across Mears Creek, 5 miles south of Castella, Shasta County; bridge structure consists of one 60-foot span and two 44-foot spans on concrete piers and abutments; contract price \$19,978.80.

Paves to County Line.

A. Teichert & Son, Inc., Sacramento.—Constructing a graded roadbed 24 feet wide and placing a bituminous macadam pavement 18 feet wide for 5.9 miles between the Estrella River and the Sacramento Ranch in San Luis Obispo County on the Cholame lateral. This project is a portion of the Cholame lateral which connects the Coast Highway with the San Joaquin Valley. When completed it will be the last unit of a paved highway from Paso Robles to the Kern County line, and will provide adequate facilities for the rapidly increasing traffic over this route. Several dangerous curves will be eliminated. Contract price, \$76,776.90.

Easier Curves, Better Alignment.

Basich Construction Company, Los Angeles.—Constructing a graded roadbed 36 feet wide and placing a Portland cement concrete pavement 20 feet wide between Kitchen Creek and La Posta, 3.9 miles in San Diego County. This project is a portion of the San Diego to El Centro road. Several short radius curves will be eliminated and the alignment and grade improved generally. Contract price \$186,446.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

B. B. MEEK.....Director
GEORGE C. MANSFIELD.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

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DIVISION OF HIGHWAYS DEPARTMENT OF PUBLIC WORKS STATE OF CALIFORNIA

C. C. YOUNG, Governor

B. B. MEEK, Director, Department of Public Works
CORNING DE SAULES, Deputy Director, Department of Public Works

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General Headquarters, Third Floor, Highway Building,
Eleventh and P Streets, Sacramento, California

THE OPEN ROAD

By JAY F. BEAMAN, Resident Engineer,
Paxton, California

The open road! When man first caught
A widening vision; when he thought
Dim distance might new beauties hold,
And strange new knowledge might unfold,
He then the far adventure sought.
He journeyed forth, by ways untaught;
The path was rough, and danger fraught,
For those who sought, in days of old,
The open road.

But pressing onward, fearing nought;
With growing knowledge, dearly bought;
With groping footsteps, toil untold,
For future men to have and hold;
Through earth and sea and sky we've wrought
The open road.

THE CONCRETE MIXER

I'm the Concrete Mixer;
Old, and ugly, and noisy;
That's me.
I'm all rusty, and
I'm all covered with mud,
But, believe me,
I can work.
I take your gravel,
Your sand, and cement,
Into my stomach,
And mix it around,
Then pour it forth,
Your precious Concrete,
For you to fashion into
Buildings, and roads,
And statues.

I'm crude, I know;
But, I love buildings,
And roads, and statues.
Hugh Brown, Palo Alto.

JOY SEEKERS

By CHARLES HORACE MEIERS, Santa Cruz

Away on the smooth straight highways
The automobiles speed along,
With riders from countless byways,
To join the great joy-seeking throng.

The honk of the claxon is vicious,
Or kindly, impatient or gay;
Sensations are chiefly delicious
As pleasure-crowds go on their way.

That fortune is ample, or meager,
The kind of a car tends to show;
But all are delighted and eager
To leave care behind as they go.

Away on the smooth straight highways
The automobiles speed along;
And riders come in from the byways
With hearts full of laughter and song.

State Highway Progress Reports

FRESNO COUNTY

Day labor forces have completed oil mixing 14 miles of the Sierra-to-the-Sea Lateral from 7 miles west of Coalinga to the Monterey County line.

Tieslau Bros. of Berkeley were successful bidders on the surfacing of oil mix material for 7 miles, from Coalinga west on Route 10. The work is expected to start at once.

Camp has been established at Kings River Canyon for the reception of convicts and the first crew of convicts arrived July 1, to start work on this route into the high Sierra.

KERN COUNTY

Force, Currigan & McLeod, Contractors on Route 57, from Bakersfield to the mouth of Kern River Canyon, are making rapid progress on their contract for grading and surfacing.

C. W. Hartman of Bakersfield is nearing completion of work on his contract for grading and rock surfacing between Pentland Junction and Route 4 on Route 57.

MADERA COUNTY

Hanrahan Company completed their contract for building approaches and paving to the Herndon Bridge over the San Joaquin River.

The Valley Paving Company were low bidders on 4.1 miles of grading and concrete paving between Berenda and Califa.

MARIPOSA COUNTY

Basich Bros. are completing their job of grading and placing crushed rock on their section of the Yosemite All Year Highway.

Oil mixing work is under way from Briceburg to Mariposa and it is expected this work will be completed by August 1.

MERCED COUNTY

Widening of grade and extending culverts by day labor is completed on the Merced section of the Yosemite Highway. This work is being done by day labor forces.

Oil mixing of shoulders and slopes north of Merced is under way and will soon be completed.

MONTEREY COUNTY

Bids are being received for the reconstruction of the Coast Highway from Salinas to Chualar, a distance of 10 miles. Reconstruction includes grading a 36-foot roadbed and placing a 20-foot asphalt concrete pavement. It is also proposed to eliminate the grade crossing of the Southern Pacific tracks near Spence by making a change of line about 0.6 of a mile in length, and constructing an underpass. Plans for the subway are being prepared by the Bridge Department.

A change of line 1.5 miles in length at the approaches to the new bridge to be built across the Salinas River at San Ardo have been prepared. Bids on the bridge were received June 26, 1929.

Plans are being prepared for a change of line about one and one-half miles in length for a new crossing at the Salinas River at Bradley. A new bridge is contemplated at this point also.

Construction work with convict labor is in progress on the Coast Highway (San Simeon-Carmel) in the vicinity of the Little Sur River, and of Villa Creek. A crew of 85 men and 2 power shovels are working at Little Sur, and 110 men and 3 shovels are working at Villa Creek. Surveys for the completion of this scenic route are in progress on the coast opposite Jolon. Approximately 5.9 miles of grading are complete, and 1.1 miles have been rough graded at these two locations. When the convict camps are moved farther in from each end, the public will be permitted to drive over this newly graded road, and will be treated to some of the most picturesque coastal scenery in the state.

SAN BENITO COUNTY

Plans have been completed for a minor line change on the Coast Highway near the San Benito River. This is a betterment of the alignment of a reverse curve.

SAN LUIS OBISPO COUNTY

On the Cholame Lateral, from 1.7 miles west of Shandon to the Kern County line, 15.4 miles of grading and paving with bituminous macadam on a water-bound base 18 feet wide are nearly complete. A. Telchert & Son are the contractors.

The reconstruction of the Coast Highway between Pismo and Arroyo Grande, 3.3 miles in length, has just been completed by the Cornwall Construction Co., Contractors. This is Portland cement concrete pavement 30 feet wide through Pismo and 20 feet wide for the remainder of the job. The Hunt process was used for curing the pavement. An improvement district has contracted for widening the pavement through Pismo to a width of 65 feet, and the Cornwall Construction Co. are doing this work also.

Just north of the city limits of San Luis Obispo a change of line one mile in length has been completed by Ariss-Knapp Co., Contractors. This road has been surfaced with a waterbound macadam and an oiled macadam surface course. This change eliminates some very dangerous alignment and steep grades.

Bids have been received on surfacing and oiling a portion of the Cholame Lateral from the Estrella River to the Sacramento Ranch, a distance of 5.9 miles. This will be similar construction to that on the adjoining section, which has just been completed as noted above. The completion of this stretch will give, with the concrete pavement out of Paso Robles for 11.5 miles, a hard-surfaced road for the entire length of this road in San Luis Obispo County.

M. J. Bevanda was recently awarded the job which consists of grading and paving with a 20-foot Portland cement concrete pavement from Cuesta to one and one-half miles south of Santa Margarita, a distance of 1.9 miles. This work straightens the present alignment and increases the sight distance on vertical and horizontal curves.

Bids were received in District V office for grading and surfacing with screened gravel on a portion of the Carmel Highway, 0.9 of a mile north of Cambria, about one mile in length, through Cambria Pines. Tiffanyv. McKeynolds & Tiffany were low bidders.

Plans have been completed for the reconstruction of the Coast Highway from Atascadero to Paso Robles, a distance of about 10 miles.

A new shop building for the District Equipment Department has been completed. This is located on district property in San Luis Obispo, acquired about a year ago. The Equipment Department has moved into their new quarters and are very much pleased with the new offices and shops.

SANTA BARBARA COUNTY

The Coast Highway between Naples and Goleta (3.5 miles) is being graded and paved (second story) with asphaltic concrete 20 feet in width. Sam Hunter is Contractor. It is expected that this work will be completed in July.

Between Benham in Ventura County and Carpinteria in Santa Barbara County, a change of line 1.2 miles in length is under construction. McCray Company are Contractors. It is expected that this work will be completed in October. This change includes an overhead crossing which eliminates a narrow subway with dangerous approaches, and a considerable shortening of the length of road.

The overhead structure crosses the main coast line of the Southern Pacific Railroad at a very flat angle, making the length 570 feet. Paul M. White is Contractor. The bridge is under the supervision of the Bridge Department.

The Cornwall Construction Company, Contractors, have completed 0.3 of a mile of 30-foot concrete pavement in Montecito.

Plans are being prepared for changes of line and reconstruction through Gaviota Canyon.

TULARE COUNTY

Masonry wall at a dangerous point on Route 10, east of Lemon Cove, has been completed by day labor forces.

HIGHWAY WORK AND EMPLOYMENT

Information is now being collected by the Division of Highways showing the effect of highway work on the unemployment situation, both as regards employment of labor directly on the state highway by contractors and the state and indirectly in the manufacture of materials, equipment and the like.

ROAD IMPROVEMENTS SECURED THROUGH NEW CONTRACTS AWARDED DURING MONTH

(Continued from page 22.)

Bridge on Highway Under Construction.

Lord and Bishop, Oroville.—Timber bridge across Little Sur River about 14 miles south of Carmel on the Carmel-San Simeon Highway, now being built by convict labor. The structure will consist of one 50-foot deck truss span on concrete piers and fourteen 19-foot spans on frame bents, concrete footings. Contract price \$27,454.

Approaches to Railroad Crossing.

Tieslau Brothers, Berkeley.—Constructing a graded roadbed 24 feet and 28 feet wide and placing a crusher run base 20 feet wide at Magra in Placer County. This project, which is 1.4 miles in length, provides the approaches to the overhead crossing at Magra, now under construction. Contract price, \$22,836.

GOOD ROADS

Good roads are friendly things; they link the town

With county seat, promote the godly plan

Of commerce blended with the heart of man.

Who fares the roadways forth may wear a crown

Or link his name ancestral with renown,

But here he joins with all the common clan

In universal brotherhood of man

And wears the bronze of woodland's golden brown.

Good roads are helpful things; they prove their good

By making distances a thing of song.

The market's call, the school's resounding gong

Are music for the timely, anxious throng;

While joining states, through ways of vale and wood,

They make a Nation just a neighborhood.

—Platt Young, in *Georgia Highways*.

NORTH CAROLINA—Over 40 miles of machine-finished asphalt top pavement was completed in 1928. The finishing machine used on one large project saved \$20 a day over hand finishing.

FIRE ENGINES FOR FIELD AND FOREST

(Continued from page 5.)

At about seven in the morning the field kitchen equipment of the truck was brought into play and ham and eggs were used to revive the spirit of the truck crew.

In looking over the burnt area after the fire, the hills were black as far as the eye could see in some directions, and in riding through it, the remains of what was once a farm house or barn could occasionally be seen.

Practical assurance that this fleet of fast fire-fighting trucks will be increased to eight in the immediate future, has been given today by State Director of Finance A. R. Heron.

With four of the forest fire engines already in service, Mr. Heron announced that in view of the established effectiveness of the new equipment in suppressing dangerous fires it is planned to rush the building of four additional trucks authorized for next year.

The fire engines now in service are stationed at Riverside, Ukiah, Auburn and Bakersfield, operating in contiguous territory.

Additional trucks are badly needed, State Forester M. B. Pratt announced, particularly to work out of Redding and Santa Cruz.

Built especially for the state service on recommendation of Governor Young's forest fire committee and State Forester Pratt, the fire trucks were planned by Prof. J. B. Fairbanks of the State College of Agriculture and Russell Stalnaker, equipment engineer of the Division of Highways, and designed by Frank E. Burnside, shop superintendent.

Bureau Chief Writes Preface To New Book On Highway Problems

WASHINGTON, D. C.—A timely publication involving an extensive study on the subject, "Highway Construction, Administration, and Finance," is announced by the Highway Education Board.

It deals with the planning of a national highway system, with the various types of road suitable for differing traffic conditions, and with methods of financing such highway building. The studies are by E. W. James, chief of the division of design, United States Bureau of Public Roads, and now on leave in Colombia assisting that South American government in organizing a road-building program. The booklet is printed in Spanish, Portuguese, and English.

"Poor roads," says Thomas H. MacDonald, chief of the United States Bureau of Public Roads, in an introduction, "cost more than do adequately serviceable roads. Roads built with honest administration and skilled technique have an earning capacity far beyond their cost. So the serviceable public highway has every right to be listed as an asset and not as an expense. It has already been well demonstrated that the highway can earn its upkeep, plus a very high profit on the investment.

"Road tolls collected in the form of motor vehicle license fees and gas taxes in the United States amount to a very large percentage of the annual highway bill, without excessive cost to the individual user. The very fact of relatively low taxes has encouraged the enormous use of the roads by so large a number of the public. This accounts for the high income from the roads in actual financial returns. It proves the value of good highways."

Recognizing that the financial problem involved in the highway program is in all countries "the fundamental and difficult one to solve," Mr. James points out that, in order to keep expenditures to a minimum, three things must be attempted:

1. To select the right roads to be improved;
2. To determine the correct types to build at any time; and
3. To build progressively, but so that all work done may be salvaged in future work.

The best method, he asserts, is "deliberately to plan a national highway system." It matters not, he adds, that pioneer roads and trails have developed, that some roads already have been improved, that cities have grown and the rural districts have been put under cultivation. Such study, he says, may disclose errors of the past and may lead to a change in location and priority of construction for many miles of highways, but if it does it saves money.

"Studies of highway systems made in the United States during the past three years," says Mr. James, "clearly demonstrate the value of such work even at a late date. But obviously the earlier in the highway history of a country such studies are made the greater good will flow from them."

The general character and condition of economic development, as revealed in data based on population, agricultural production in tonnage for general crops and in cost for special crops, such as dairy products delivered directly for consumption, and manufactured products by cost, must be surveyed, it is stated, in approaching a national or state highway plan. Other factors which must be considered include topography;

Forest and State Officials Work to Save Road Scenery

The following self-explanatory letter has been received by Director B. B. Meek from S. B. Show, District Forester, with headquarters at San Francisco:

Mr. Barrett's letter to Mr. Purcell expresses accurately what the Forest Service has in mind in regard to protection of scenic values along state highways. You are correct in assuming that we do not intend to issue permits for buildings or structures within less than 100 feet of the center line of state highways on national forest land except in very unusual circumstances. I hope that you will understand that on private lands within the national forests we have no authority to regulate the placing of buildings and that on such lands the problem will have to be handled by the Commission.

You understand, too, I am sure, that we have a number of existing permits under which buildings have been constructed within less than 100 feet of the center line of state highways on national forest land. Where such circumstances exist it is our desire and intention to remedy the situation as rapidly as possible but even with our best efforts it is certainly going to take time to work out case by case these complications. It is our desire to work in closest possible harmony with the Commission in future developments along state highways and I am sure the forest supervisors will be glad to discuss with your division engineers permits which may arise in the future. I think you understand that our wishes are identical with your own, viz., to preserve to the maximum possible extent the scenic values along the state highways and not to clutter up the edges of the highways with unsightly structures.

Very sincerely yours,

S. B. SHOW,
District Forester.

existing traffic on the roads and the classification of this traffic; and the probable adequate mileage of roads in the system as a whole and in the several political or economic subdivisions thereof.

Emphasis is laid in the Highway Education Board's report on the importance of the progressive method of road building which, it is asserted, is "the only way possible to give service within any reasonable period to a state or nation which yet has most of its pioneer roads to improve."

As to financing it is declared that "roads should be built only to the extent and of such types as will pay for themselves." Every piece of construction, it is asserted, should be planned with an eye to the future and to the possibility, indeed to the probability, that a betterment of type will be required. Any highway expenditure to be justified must be earned by the road in the form of cheaper transportation, says the report, which argues that highways are fundamental requirements in a healthy, progressive, prosperous, and ambitious nation.

"She's a very nicely reared girl, don't you think?"

"Yeah. She don't look so bad from in front, either."—*Deschutes Pine Echoes.*

MAGNIFICENT HIGHWAY IS FORMALLY OPENED

(Continued from page 8.)

You have been patient and long suffering. We have built it as soon as it was humanly possible, since we came into office, as fast as good engineering and good construction practice would permit. We are already planning a highway twice as wide in view of the tremendous traffic that we know it is going to have to bear. We have already made our plans for this in the excavations.

COMMISSIONERS SPEAK

Commissioner Harris of Fresno declared: "This wonderful Southland amazes me every time I come into it and see the growth you have made."

California will soon have a population of 15,000,000 or 20,000,000 and we propose to build roads adequate for its traffic. We are making studies of future needs and are planning for the future—planning for the construction of the best that can be built, the best in the world. We are Californians building California roads and to us there is no north, no south, no east, no west, but one grand state, and highways are the best means of cementing the people of the different portions of our commonwealth.

Commissioner Baumgartner of Santa Ana asserted that "the completion of this wonderful highway shows that there is no insurmountable obstacle to the accomplishment of a worthy thing when California undertakes it."

I like to think of these great highways not in local terms, but in national terms, even in world-wide terms. This wonderful highway stretching up the coast from Mexico to Canada, over 2000 miles in length, belongs to the world and binds together the peoples of three nations.

Those bluffs to the south of you in the direction of Santa Monica will within a few years be surmounted by magnificent homes rivaling in beauty the famous castles on the Rhine. This road will belong to the ages and will stand as a monument to the peace of this Golden Age, as the Roman roads stand today as a monument to the soldiers of the Caesars.

Commissioner Moody of San Francisco, spoke briefly, expressing the hope that "the good people of this section will live for years to enjoy this magnificent highway which Governor Young dedicated today to your use and enjoyment and to that of the people of the world."

FACTS ABOUT THE ROAD

Here are some facts relative to the road:

State Highway No. 60, Oxnard to Santa Monica, was added to the state highway system by the 1919 Bond Act appropriating \$40,000,000 and adding additional highways to the system, this route being described as Oxnard to San Juan Capistrano.

The section from Oxnard to Santa Monica is 45.6 miles long, of which the first 10 miles, or until Point Magu is reached, lies through low cultivated areas

and across tide flats where material had to be hauled in to give a sufficient height to the embankment that carries the roadway.

From Point Magu to Santa Monica the remaining 3.6 miles lie among the face of the cliffs that dip into the ocean except at Dume point where the road turns inland for a distance of about $2\frac{1}{2}$ miles and is at a maximum distance of approximately $1\frac{1}{2}$ miles from the ocean.

The first contract covered the construction of 20 foot Portland cement concrete pavement between Santa Monica and Los Flores canyon, a distance of 7.4 miles. This contract was awarded to Lee Moor Contracting Company in November, 1922.

The close approach to each other of sea and cliff made surveys for the road's location exceedingly difficult and the road as located required the removal of a very large yardage to secure the necessary recess in the cliff's contour to permit the road's completion. A total of 2,440,500 cubic yards has been moved under the various contracts. Various methods have been used to protect the slopes of the roadbed from the destructive action of the waves.

Twenty-four groins consisting of timber frames filled with large boulders have been constructed at various points. These groins extend at right angles to the beach and are about 60 feet in length.

Over 40,000 cubic yards of heavy rip-rap have been placed at places where the wave action is more severe or where erosion of the retreating waves has threatened the stability of the slopes.

Three hundred reinforced concrete shells have been constructed, placed upon a prepared foundation and then filled with concrete to act as a first line protection for further protection work to follow.

Six hundred linear feet of rock filled cribbing has been constructed near Magu wharf as a guard against the encroaching seas.

All grading, paving and shore protection work on this route was done by the state at a cost of \$3,865,000, of which \$234,000 was spent or allotted for shore protection work completed or under way. Original funds were obtained from 1919 bond issue of \$40,000,000. Additional funds for completing this section were obtained from the additional one cent gas tax of 1927. Bridges were built by Ventura and Los Angeles counties.

CONCRETE TESTS NOW BEING MADE UPON IMPERIAL HIGHWAYS

A test is being carried on in the Imperial Valley near Brawley which is attracting widespread interest. It consists of experiments with several different curing processes of concrete pavements and several different admixtures in concrete. Eleven different surface treatments and processes designed with the idea of sealing the surface of the pavement against evaporation, together with one process designed with the idea of stopping the subsoil from drawing water from uncured concrete, are being tried out.

The pavement is complete but the removal and breaking of test specimens will continue for several months. Definite conclusions will not be available until after the test specimens have been broken.

Report Made on Crossing Accidents

A concerted effort is being made by the California Railroad Commission, the Division of Highways and the railroads to eliminate grade crossing accidents. With this object in view the Transportation Division of the Commission's Engineering Department is keeping a careful check of all grade crossing accidents, and is making a detailed study of measures to prevent them.

Despite this effort Engineer Joseph G. Hunter, chief of the Transportation Division, today reported to the commission that during the first four months of 1929 there were 932 accidents at grade crossings, resulting in the death of 61 persons and the injury of 307. This is a marked increase in the number of accidents during the first four months of 1928, when there were 583, resulting in the death of 71 persons and injury to 229.

The Transportation Division calls attention in its report to the commission to the fact that the legislature at its last session, amended the Motor Vehicle Act to require all vehicles on the highways to stop before crossing over a railroad track when a warning signal is being displayed either by human flagman or automatic signal announcing the approach of a train. This amendment, which makes violation of its provisions a misdemeanor, punishable by fine or other penalties, becomes effective August 14, 1929. The Railroad Commission participated in the recommendation of the California Safety Council for the enactment of such a measure.

A study of the accident records for 1929 shows that there were 416 accidents at crossings without special protection during the first four months of this year. These accidents resulted in the death of 26 persons and the injury of 151. There were 369 accidents at crossings protected by some special signal, such as wig-wags, crossing gates and human flagmen, in which 24 persons were killed and 135 injured. The record also shows that 99 accidents occurred through vehicles running into crossing gates, resulting in the injury of four persons. During the same four months there were 11 accidents involving pedestrians with six persons killed and four injured. There were 16 accidents at private crossings, resulting in the death of three, and the injury of nine persons. In addition there were 21 accidents from miscellaneous causes, resulting in the death of two persons and the injury of four others.

JUST SURFACING

Small Boy: "What is college bred, pop?"

Pop (with son in college): "They make college bred, my son, from the flour of youth and the dough of old age."—*Two Bells*.

She came home with her hat on one side and her clothes all crushed looking.

"Looks as though she's been knocked down by a motorist," said one neighbor, sympathetically.

"Or picked up," said another, thoughtfully.

Taking the other fellow's dust is better than "to dust returneth."

Six feet have awaited many a driver who would not give an inch.

Just because you see its tracks is no sign that a train has just passed.—*Badger Highways*.

ELECTRICITY DEFINED

Electricity is something that starts the Lord knows where and ends in the same place. It is 1/36 of a second faster on its feet than its nearest competitor, backyard gossip, and when turned loose in Europe will get to the United States five hours before it starts. Nobody knows exactly what it is because it has never stood still long enough.

Electricity is sometimes known as science gone crazy with the heat, and if you can understand its maneuvers, you can do anything with it except open a can of peanut butter at a picnic.

Electricity was locked up in ignorance for centuries until Ben Franklin let it out with a pass key, and since then it has been pulling off more new stunts than a pet monkey.

With it you can start a conversation or stop one permanently, cook dinner, curl your hair, press your trousers, blow up a battleship, run an automobile or signal Mars, and many more things are being invented. —*Utility Bulletin*.

"In other days the women wore their dresses down to their insteps."

"Yes, but now they wear them up to their stepins."

"The time will come," shouted the speaker, "when women will get men's wages."

"Yes," said a little man in the corner, "next Friday night."

Engineer predicts a fool-proof plane in another five years. However, the whole history of mechanics is that nothing is fool-proof as long as there's a fool. —*Arkansas Gazette*.

When the preacher called for women to stand up and promise to go home and mother their husbands only one little woman arose, and when he told her to go home at once and mother her husband, she said, "Mother him? I thought you said smother him."

"Why, Buddy," asked the teacher coming to a halt by his desk, "what are you drawing?"

"A picture of God," was the reply.

"But, Bobby, you must not do that. That's something that no one knows—how God looks."

"Well," Bobby confidently smiled, "they will when I get through with this."

The late William Rockefeller used to tell with delight a story illustrative of the financial genius of his famous brother, John.

"When John was a little fellow," he would begin, "a so-called Indian doctor visited our town with a cure-all. The doctor, to get started, took out a bright new silver dollar and said he would auction it off.

"How much am I bid?" he said, "for this bright silver dollar?"

"But the crowd was cautious, silent, suspicious. No bids were made.

"How much am I bid?" shouted the Indian doctor. "Come, come, gents! A nickel? A dime?"

"I bid a nickel," piped John D. Rockefeller at last.

"The dollar is yours, boy," said the doctor. "Hand up your nickel."

"Take it out of the dollar," piped little John D., "and gimme 95 cents change." —*Boston Globe*.

BUILDING SAFETY INTO STATE HIGHWAYS

(Continued from page 10.)

CONQUERING THE DUST MENACE

Dust on earth or rock surfaced roads is not only an annoyance but a decided hazard as well. An extensive program of dust laying is now under way on 1000 miles of our highway. Practically all of the rock surfaced roads have received an oil treated surface in the past two years and the hazard eliminated on some 1243 miles of such roads.

SMOOTHNESS AND SAFETY

In routine upkeep work particular attention is given to securing smooth-riding road surfaces. A considerable mileage of sandy or loose shoulders, particularly where adjacent to narrow pavement is being oiled this season. Nearly 700 miles are proposed for oil treatment during this coming biennium. Asphaltic concrete pavements, which have become rough and corrugated, are smoothed with a heavy planer. This planing also removes the excess asphalt and reduces the hazard from skidding when the pavements are wet. Nonskid surfaces have been placed on many asphaltic surfaced bridge floors. In frosty weather, the old smooth surfaces are extremely slippery. This work will be extended as necessary, and is also being tried out on slippery pavement sections. Sanding of pavements is carried on in foggy, frosty sections during the period of danger. Constant vigilance is expected of the maintenance organization on that score.

Warning signs are installed at locations where slippery conditions may be expected in wet weather. On some sections of mountain routes, where guard rail is not in place, curve warning posts, painted white, are placed to guide traffic in night driving. Marker posts are placed at the headwalls of pipe culverts to show traffic limits of the safe width.

WARNING SIGNALS

Reflector signals are installed at the more dangerous curves to warn traffic. The signals are single six-inch bullseye reflectors, or of the nine unit assembly of three-inch bullseyes. These signals attract attention at a distance of 600 feet. Large RXR signs, made up of the three-inch bullseyes, are being installed at a number of grade crossings. The Railroad Commission, at request, has arranged with railroad companies for several wigwag signals at various crossings. Overhead, illuminated railroad crossing signs are being installed at the more dangerous crossings.

Trees along the highway are given periodic inspection and overhanging limbs and decayed trees in dangerous situations are removed. Bridges are inspected so that dangerous conditions may be detected and corrected in time to prevent accidents.

GUARDING AGAINST ENCROACHMENTS

The placing of encroachments on the right of way and the planting of trees is guarded under permit so that dangerous situations will not occur. Temporary fruit stands are not permitted on the right of way and an effort is made to control the itinerent vendors who create a hazard through parking of customers' cars in traffic.

Particular attention is given to training the maintenance personnel to handle their work in such manner as to safeguard traffic. Accident reports are studied to ascertain if the accident was caused by the condition of the highway.

Several of the points brought out above are incidental to the carrying out of highway work but most of the items represent a direct expenditure which returns large dividends in insurance against personal and property damage.

THE MOTORIST FINALLY DECIDES

The Division of Highways desires to cooperate with other state agencies, with the automobile associations and with all organizations interested in safety measures, to the end that the public may use their highways in SAFETY. Particularly it bespeaks the assistance and the cooperation of the individual motorist. The reckless motorist can make the safest highway dangerous; and conversely, the careful motorist will ride in safety over a highway that, judged by technical standards, might be considered unsafe.

The best that the Division of Highways can do is to make the highway safe for the sane motorist. We are spending millions of dollars in doing this. But these expenditures and the months of effort spent in planning and building our highways can all be undone in the fraction of a second's time by the careless driver. I appeal to the individual motorist to do his part in this great work of making our highways safe by seeing to it that he drives in a safe and sane manner, with due consideration for the rights and the safety of other users of the highway.

KANSAS—Under a new law the state shall not construct more than 100 miles of high-type pavement in any one year until all the state highway system has been improved with an all-weather surface such as sand, gravel, stone or chat.

HIGHWAY BUILDING PROGRAM IS DRIVING AHEAD OF SCHEDULE

(Continued from page 12.)

construction projects, the funds for which came from the 1-cent gasoline tax, one of the major measures in Governor Young's program, and one of the first legislative enactments to receive his signature.

The distribution of funds for construction and reconstruction projects was determined by the percentage requirements set up in the Breed Bill.

Reconstruction, maintenance, right of way and other expenditures bring the total state highway disbursements for the biennium to an approximate total of \$41,074,736.55.

Construction and reconstruction projects during the biennium totaled 1030 miles. This establishes a new record in state highway history. During the two-year period a total of 103 new bridges were constructed at a total expense of \$3,000,000 and 17 bridges were widened. Twenty-four railroad grade crossing eliminations were either completed or contracts for their construction awarded. Contracts were awarded on 406 projects during the biennium.

Mr. Meek also reported that prior to June 30, 1929, contracts had been awarded for 17 projects in the program for the biennium of July 1, 1929-June 30, 1931.

Following the submission of the report, Mr. Meek made the following statement: "Too much credit can not be given to Ralph W. Bull, J. P. Baumgartner, M. B. Harris, Fred S. Moody and Joseph M. Schenck, members of the California Highway Commission, for the able manner in which they have fulfilled the duty imposed upon them by law, namely: that of determining the program upon which state highway construction proceeds and the allocation of funds to the different projects.

"That this program is proceeding on schedule is due to the energy and ability of State Highway Engineer C. H. Purcell and his assistants, both at headquarters and in the district offices. The largest building program in the history of the state highway system was launched by them. They have spared neither effort nor hours in seeing that projects were ready for advertising and award in accordance with the schedule prepared for them.

"I feel that the volume of state highway expenditures is contributing to the prosperity

Too Many Children

Are Crippled Each Year

Playing With Blasting Caps

There are several hundred children crippled each year in the United States by playing with blasting caps which they have picked up in the vicinity of mines, quarries, or in the fields where agricultural blasting has been done.

This means that there are several hundred children who will have to go through life with mangled hands, faces, arms and legs. Some of them are killed.

Boys often play in and around quarries and sometimes pick up stray caps and start to investigate them. It is the rarest thing that they ever do this without getting hurt.

They perhaps know they are dangerous, and that a spark or a blow will explode them; but they do not realize how sensitive they are, how violent the explosion, or how the pieces of copper fly. Even the name is misleading in this respect. The word "Caps" suggest the paper caps used with toy pistols, and because the blasting caps are called by this name it is natural to think that the two articles belong to the same family. They may but they bear about the same resemblance to each other that a hungry, man-eating tiger does to the gentle pussycat.

A blasting cap is a copper shell about a quarter of an inch in diameter and an inch or two long, half full of fulminate of mercury. This fulminate is the most sensitive and about the most impulsive explosive in common use. Blasting caps contain anywhere from 15 to 30 grains of it; primers for firearms cartridges usually contain not more than $\frac{1}{2}$ grain. That's what the hammer or firing pin of a gun or pistol hits to ignite the powder in the shell. A blasting cap is meant to work the other way. The powder from the fuse ignites the fulminate in the blasting cap, and it explodes with terrific force and detonates the dynamite. The explosion of the fulminate is so exceedingly quick that the flying particles of copper will imbed themselves in iron a foot away. They will blow a hole clean through a steel plate one-sixteenth of an inch thick. A box of caps will blow a hole right through a two-inch oak plank. One cap will blow a child's hand off.

If all the children mangled during the past year by blasting caps had been hurt at one time, what an impression would have been created. But because the accidents are spread all over the country and happen at the rate of only about forty or fifty a month, nothing is done. Indeed the best thing to be done is to educate the whole population to realize how dangerous these exceedingly useful things are when they are out of their proper place, and what a dreadful thing it is to go through life crippled or blinded for want of a little care and knowledge.

of California through the large sums that are being distributed directly to labor and in the purchase of materials and supplies, and in the reduced cost of moving farm and other products to market. But even greater prosperity will come through the completion of the highways and the volume of business that improved highways bring to the state and its communities."

A WORTHWHILE DISTRICT ORGANIZATION

(Continued from page 15.)

This might be classed as trivial, but where 20 or 30 men are employed, the saving of half an hour a day for each person really amounts to considerable time at the end of a year, and at the same time has a tendency to make work better. We are all, to an extent, victims of the disease that makes us slight our work if the same particular part has been repeated many times in cut and try work.

These ideas have readily been given consideration by department heads, only for the reason that they have considered themselves one of us, and has had the tendency among the employees to have a higher regard for the dignity due a department head.

Much can be said for the educational benefits derived from the meetings. Perhaps the most important is the part in which a particular person has been active.

Our office force is to a great extent made up of young men who have not had the opportunity to talk before others, and, like most persons, were timid when it came to the point of standing before a gathering and talking, let alone presenting an idea to be considered. The first step toward this end was the scheduling of two members to give five minute talks or readings before each meeting. While some of the talks were short of the allotted time, others were inspired to such an extent that the talks continued for as much as fifteen minutes. To say that the effect has been accomplished can be proven by showing how the boys now debate a subject that has been presented for consideration.

Lectures by department heads and other persons feeling capable of talking for half an hour or more on a subject of interest have served a very good purpose and have been of great variety.

Mr. E. K. Guion presented "Highway Location and Location Economics" on two different occasions. In both of the talks, points of vital importance were brought to the attention of his listeners, whereby many of the mistakes of the past can be seen and at the same time placed something in our minds so that similar mistakes of location can be guarded against in the future.

Mr. F. W. Haselwood carried us through "The Development of the Highway Organization," showing what has been done in the past in order that highway work can and is expected to be more efficient today both to the department as constructors and to the public as users.

Mr. A. C. Irish read a thesis prepared by Mr. F. W. Haselwood on highway location, which embodied the fundamentals necessary for a near perfect highway.

Mr. F. W. Howard deviated from "Shop" and gave us many pointers on letter writing, all of which will be of value whether we become executives or not.

Mr. J. L. Piper brought to our attention "Construction Details and Problems." We of the office get very little opportunity to look upon the construction part of the work. No doubt this talk can be credited with the reason for several transferring to the construction department.

Mr. H. D. Jerrett chose as his subject "Rights of Way Problems." Details necessary to his department and its work were brought to our attention, many of which in the past seemed nonessentials to us, but have proven to be extremely important.

Mr. P. R. Green spoke on "Organization." His

talk brought out the benefits derived from organization in the past and its possibilities in the future, all of which can be expected from "The Forum."

Mr. J. W. Vickrey told us of his department, "Maintenance," one which receives little thought from the planning department, but which is extremely important to the life of a highway and the comfort of the traveling public.

At our last meeting Mr. Chas. H. Whitmore, our new District Engineer, gave "The Forum" his support and related to us his ideas in the past of providing a means of bringing employee and department head together. He also spoke highly of the idea and encouraged the continuation of the part next to follow. A short study course was instituted several months ago, and Mr. N. T. Pratt was elected to the first course, having made two trips into the field to inspect location and construction and to make a report to "The Forum" of his findings.

One trip was over the projects known to us as the "Bowman-Weimar Line Changes" and the other the "Magra Line Change," the former being one of construction and the latter one of location. His report explained the methods and equipment employed and the possibilities to be expected regarding the completion of the contract. He further gave his views with regard to possible improvement of the line proposed at Magra, all of which have been given consideration and, if the change is adopted, his suggestions no doubt will carry considerable weight.

His second trip was over the contract now in progress at Clear Lake. The report on this trip dealt more with the reasons for the highway being located as it was. It might be said that land values were a big factor to be considered on this location.

It was the intention at the time we organized "The Forum" to have only a chairman and secretary to serve terms of three months, allowing a larger number of persons to develop their ability as executives. While there are no weighty problems involved, a great deal can be said for the chairman who provides a good program for the members and keeps up attendance. This establishes a mark for the succeeding chairman to attain and continually provides growth to the organization whereby it shall survive.

In conclusion I might say that organizations of this kind have beneficial characteristics that can be of great help wherever instituted and personally I feel that in time each state department, at least, will be banded together in such a way.

ALABAMA—State highways totaling 1350 miles in length were affected by the flood of the past spring. A much larger mileage of local roads was damaged. Repairing or reconstruction of state roads will cost at least one thousand dollars a mile, it is estimated. The principal damage was to sand fills. No important bridges were washed out.

KENTUCKY—Tree planting along state roads by various semi-public organizations is to be coordinated under plans and regulations now being developed. While no road funds are available for placing trees, the state highway department will maintain them under the direction of a tree expert furnished by the state horticultural society.

"There are just two things that break up most of the happy homes nowadays."

"What are they?"

"Women's love for dry goods and man's love for wet goods."—*Patton's Monthly*.

Record of Bids and Awards

BID OPENINGS FROM JUNE 4, TO JULY 17

ALAMEDA COUNTY—Between Hayward and Niles, about 8.7 miles to be graded and paved with Portland cement concrete and asphalt concrete. Dist. IV, Rt. 5, Sec. C. J. F. Knapp, Oakland, \$360,380.40; Healy-Tibbitts Const. Co., San Francisco, \$399,485.40; Jones and King, Hayward, \$361,503.24; Heafey-Moore Co., Oakland, \$399,917.50. Contract awarded to Hanrahan Company, San Francisco, \$325,305.85.

ALPINE COUNTY—A 40-foot reinforced concrete bridge over Markleeville Creek and grading approaches 24-ft. wide and placing crushed gravel or stone surfacing 20 feet wide and 8 in. thick. Dist. X, Rt. 23, Sec. D. C. Miles, Sacramento, \$18,806. Contract awarded to Camino Construction Co., Inc., Palo Alto, \$17,536.

BUTTE COUNTY—4½ miles east of Oroville, a reinforced concrete arch bridge over the tracks of the Western Pacific Railroad and across the Feather River. Dist. II, Rt. 21, Sec. B. Healy-Tibbitts Const. Co., San Francisco, \$321,194; Guy F. Atkinson Co., San Francisco, \$218,582; Ward Engineering Co., San Francisco, \$298,545; Lord and Bishop, Oroville, \$177,560; Rocca & Caletti, San Rafael, \$213,322.50. Contract awarded to Paul M. White, Santa Monica, \$169,947.40.

EL DORADO COUNTY—Two timber bridges. One across Upper Truckee Creek, 5 miles north of Meyers and one across Trout Creek 6 miles north of Meyers. Dist. III, Rt. 11, Sec. K. Griffith-Hunter, Inc., Sacramento, \$14,185.50; M. B. McGowan, San Francisco, \$15,926; H. C. Whitty, Sanger, \$17,861; C. C. Gildersleeve, Felton, \$17,950. Contract awarded to Lord & Bishop, Oroville, \$14,090.

EL DORADO COUNTY—Constructing a reinforced concrete double box culvert across Meeks Creek. Dist. III, Rt. 28, Sec. C. Contract awarded to D. McDonald, Sacramento, \$9,050.

HUMBOLDT COUNTY—Near Beatrice, a bridge across Salmon Cr. consisting of two 31-ft. reinforced concrete girder spans on a concrete bent and concrete abutments with wing walls on pile foundations. Dist. I, Rt. 1, Sec. G. B. T. Millard and John Lohost, Loleta, \$11,157; Smith Bros. Co., Eureka, \$10,935.60. Contract awarded to Fred J. Maurer, Eureka, \$10,902.50.

LASSEN COUNTY—Bet. Goodrich and Coppervale, 4.4 miles to be graded and surfaced with untreated crushed gravel or stone. Dist. II, Rt. 29, Sec. A. A. J. Grier, Oakland, \$94,911; Tiffany-McReynolds, Tiffany, San Jose, \$75,837.80; Chas. Harlowe, Jr., Oakland, \$90,228; Tieslau Bros., Berkeley, \$106,780.60; J. P. Johnston, Stockton, \$99,690.10; C. Miles, Sacramento, \$83,375; Hemstreet & Bell, Marysville, \$91,365; Young Bros., Berkeley, \$93,476.85; Meyer-Rosenberg, San Francisco, \$91,501.10; Isbell Const. Co., Carson City, \$99,815; R. L. Oakley, Palo Alto, \$108,096; Smith Bros., Eureka, \$85,580; J. P. Holland, Inc., San Francisco, \$91,601.80; A. D. Drumm, Jr., Fallon, \$69,933. Contract awarded to Doveri and Co., and J. A. Maddox, Klamath Falls, \$68,213.20.

LASSEN COUNTY—Bet. Susanville and 2 miles west of Milford, about 19.4 miles to be surfaced with untreated crushed gravel or stone and crushed gravel or stone screenings to be stockpiled. Dist. II, Rt. 29, Sec. C-D. Mathews Construction Co., Sacramento, \$51,987.50; Hemstreet & Bell, Marysville, \$54,712; Milne & Dussault, Portland, \$46,446; Smith Bros., Eureka, \$53,311.20; W. J. Taylor, Palo Alto, \$47,763.68; A. D. Drumm, Jr., Fallon, \$49,686; Tieslau Bros., Berkeley, \$55,046. Contract awarded to Hein Bros. and Chittenden, Napa and Petaluma, \$38,536.90.

MADERA COUNTY—About 4.1 miles to be graded and paved with Portland cement concrete between Berenda and Califa. Dist. VI, Rt. 4, Sec. B-C. C. W. Wood, Stockton, \$182,182; W. A. Dontanville, Salinas, \$188,633; Hanrahan Co., San Francisco, \$169,968; Matich Bros., Elsinore, \$169,318; Wells and Bressler, Santa Ana, \$200,167; Sander Pearson, Santa Monica, \$184,083; John Jurkovich, Fresno, \$171,905. Contract awarded to Valley Paving & Const. Co., Visalia, \$164,511.10.

MARIN COUNTY—A bridge across Novato Creek, about 1 mile south of Novato, consisting of four 34-ft. reinforced concrete girder spans on concrete pile bents. Dist. IV, Rt. 1, Sec. A. Ben C. Gerwick, San Francisco, \$30,661; Mathews Const. Co., Sacramento, \$31,-

958; M. B. McGowan, San Francisco, \$32,492; Pan Pacific Piling and Const. Co., Los Angeles, \$38,728; R. L. Oakley, Palo Alto, \$29,135. The Duncanson-Harrelson Co., San Francisco, \$40,914. Contract awarded to W. L. Proctor, Santa Rosa, \$27,961.

MARIN COUNTY—Through the town of San Anselmo, 0.6 of a mile to be surfaced with asphaltic concrete. Dist. IV, Rt. 1, Sec. B. Pacific States Const. Co., \$10,915; P. S. Harless, San Rafael, \$11,534. Contract awarded to A. F. Raisch, San Francisco, \$10,417.

MONO COUNTY—About 3 miles to be graded and surfaced with untreated crushed gravel or stone, between McGee Cr. and Convict Creek. Dist. IX, Rt. 23, Sec. D. A. R. McGrath, La Canada, \$36,241.70. Contract awarded to Monfort and Armstrong, Sacramento, \$26,331.80.

MONTEREY COUNTY—A bridge across Salinas River at San Ardo, consisting of ten 100-ft. steel deck truss spans and seventeen 37-ft. reinforced concrete girder spans. Dist. V, Rt. 2, Sec. H. Lynch-Cannon Engr. Co., Los Angeles, \$276,428; M. B. McGowan, San Francisco, \$240,905; Butte Const. Co., San Francisco, \$258,875; Pan Pacific Piling & Const. Co., Los Angeles, \$246,749; Rocca and Colletti, San Rafael, \$267,432; Lord and Bishop, Oroville, \$276,053; A. W. Kitchen, San Francisco, \$260,252; Healy-Tibbitts Const. Co., San Francisco, \$259,541; McWilliams and Ritchey, Los Angeles, \$255,692. Contract awarded to Ben C. Gerwick, Inc., San Francisco, \$233,107.

MONTEREY COUNTY—Bet. Chualar and Salinas, 10.3 miles to be graded and paved with asphalt concrete. Dist. V, Rt. 2, Sec. B. Clark & Henery Const. Co., San Francisco, \$338,894; A. Tiechert & Son, Sacramento, \$287,324; Sam Hunter, Santa Barbara, \$301,683; Western Roads Company, Oakland, \$261,305; Granite Const. Co., Watsonville, \$247,520; Force, Curigan and McLeod, Oakland, \$289,530; A. J. Raisch, San Jose, \$313,748; Steele Finley, Santa Ana, \$232,937; George R. Curtis Paving Co., Los Angeles, \$268,336; Fred W. Nighbert, Bakersfield, \$309,448; Union Paving Co., San Francisco, \$276,443; Cornwall Const. Co., Santa Barbara, \$307,926; Valley Paving & Const. Co., Visalia, \$257,210; Hanrahan Co., San Francisco, \$243,036. Contract awarded to Peninsula Paving Co., San Francisco, \$236,484.85.

MONTEREY COUNTY—14 miles south of Carmel, a timber bridge across Little Sur River. Dist. V, Rt. 56, Sec. G. C. C. Gildersleeve, Felton, \$31,170; M. B. McGowan, San Francisco, \$27,777; Edward G. Hart, San Francisco, \$31,336; M. J. Murphy, Carmel, \$28,847. Contract awarded to Lord and Bishop, Oroville, \$27,454.

ORANGE COUNTY—Bet. Santa Ana and Anaheim, 4.9 miles to be paved with Portland cement concrete. Dist. VII, Rt. 2, Sec. D. Matich Bros., Elsinore, \$208,072; E. Paul Ford, San Diego, \$199,685; Geo. Herz & Co., San Bernardino, \$195,649; Jahn and Bressi, Los Angeles, \$192,393; Sander Pearson, Santa Monica, \$223,297; Wells & Bressler, Santa Ana, \$194,846. The Western Const. Co., Los Angeles, \$241,784. Contract awarded to Griffith Co., Los Angeles, \$184,301.

PLACER COUNTY—At. Magra, 1.5 miles to be graded and surfaced with crusher run base bituminous surface treated. Dist. III, Rt. 37, Sec. D. C. W. Wood, Stockton, \$24,782. Contract awarded to Tieslau Bros., Berkeley, \$22,836.

PLACER-NEVADA COUNTIES—Bet. Airport and Indian Springs, 9.3 miles to be graded. Dist. III, Rt. 37, Sec. E-A. J. M. DeLuca, Oakland, \$599,519; Jasper Stacy Co., San Francisco, \$690,937; Isbell Const. Co., Carson City, \$477,685; S. H. Palmer Co., San Francisco, \$409,200; Guy T. Atkinson, San Francisco, \$722,691; J. P. Holland, Inc., San Francisco, \$714,645; Nevada Contracting Co., Fallon, \$396,610. Contract awarded to T. E. Connolly, San Francisco, \$396,385.

SACRAMENTO COUNTY—A bridge across Cosumnes River with timber approaches, and two bridges across overflow channels. Dist. X, Rt. 4, Sec. A. A. W. Kitchen, San Francisco, \$138,873; Healy-Tibbitts Const. Co., San Francisco, \$163,859; M. B. McGowan, San Francisco, \$148,172; Mathews Const. Co., Sacramento, \$158,227; Frederickson & Watson Const. Co., Oakland, \$138,280; George J. Ulrich Const. Co., Modesto, \$139,985; Ben C. Gerwick, Inc., San Francisco, \$132,121; Lord & Bishop, Oroville, \$141,994; E. B. Skeels, Roseville, \$155,598. Contract awarded to Griffith-Hunter, Inc., Sacramento, \$126,850.50.

SACRAMENTO COUNTY—Bet. Arno and McConnell, 1.2 miles to be graded and surfaced with untreated crushed gravel or stone. Dist. X, Rt. 4, Sec. A. A. Tiechert & Son, Inc., Sacramento, \$93,279; Gannon and McCarty, Stockton, \$72,503; C. T. Malcom, Walnut Creek, \$71,454; J. E. Johnston, Stockton, \$84,943; Hemstreet & Bell, Marysville, \$64,452; Charles Miles, Sacramento, \$77,749; Frederickson and Watson Const.

Co., \$71,546. Contract awarded to Larsen Bros., Sonoma, \$57,998.50.

SACRAMENTO COUNTY—Reinforced concrete girder bridge across Arcade Creek, 11 miles east of Sacramento on the Auburn route. Dist. III, Rt. 3, Sec. B. The Adams Co., Angels Camp, \$17,693; E. B. Skeels, Roseville, Cal., \$14,784; Lord and Bishop, Oroville, \$15,268; Frederickson and Watson Co., Oakland, \$13,361. Contract awarded to Geo. J. Ulrich Const. Co., Modesto, \$13,131.

SAN BERNARDINO COUNTY—Two reinforced concrete bridges, one across San Antonio Cr. at Pomona, and one across Collins Dip, 4 miles east of Ontario. Dist. VIII, Rt. 19, Sec. A-B. Whipple Engr. Co., Monrovia, \$34,942; Oberg Bros., Los Angeles, \$42,604; DeWaard & Son, San Diego, \$38,067; Storm & Mahoney, Inc., Pomona, \$38,838; George Herz & Company, San Bernardino, \$34,528; E. M. Funk, Santa Ana, \$42,220; Orvall Schubach, Riverside, \$36,211; Byerts and Dunn, Los Angeles, \$37,676; Franklin B. Gridley, Pasadena, \$43,411; E. S. Johnson, Pasadena, \$36,758. Contract awarded to W. J. Netherery & Sons, \$33,170.65.

SAN BERNARDINO COUNTY—At Barstow, an overhead crossing over the A., T & S. F. Dist. VIII, Rt. 58, Sec. D. Mercer-Fraser Co., Eureka, \$175,263 C. M. Elliott, Pasadena, \$158,856; Sharp & Fellows, Los Angeles, \$143,520; Chas. U. Heuser, Glendale, \$181,105; E. S. Johnson, Pasadena, \$167,067; M. B. McGowan, San Francisco, \$170,827; Oert Bros., Los Angeles, \$17,675; Ben D. Gerwick, San Francisco, \$167,011. Contract awarded to Lynch-Cannon Engr. Co., Los Angeles, \$155,381.

SAN BERNARDINO COUNTY—Bet. San Bernardino and Santa Ana River bridge, 1.7 miles to be graded and paved with Portland cement concrete. Dist. VIII, Rt. 26, Sec. A. Match Bros., Elsinore, \$62,268; William D. Bohan, San Bernardino, \$79,693. Contract awarded to George Herz & Co., San Bernardino, \$60,846.40.

SAN DIEGO COUNTY—Bet. Kitchen Creek and La Posta, about 3.9 miles to be graded and paved with Portland cement concrete. Dist. VII, Rt. 12, Sec. F. R. E. Hazard Contracting Co., San Diego, \$197,022. Contract awarded to Basich Bros. Const. Co., Los Angeles, \$186,446.

SAN JOAQUIN COUNTY—Bet. Banta and San Joaquin River, 3.1 miles to be graded and paved with Portland cement concrete. Dist. X, Rt. 5, Sec. B. Hanrahan Co., San Francisco, \$144,892; Prentiss Paving Co., San Jose, \$152,508; Lewis Moreing, Sacramento, \$153,087; Frederickson & Watson, Oakland, \$149,831; W. A. Dontanville, Salinas, \$156,401. Contract awarded to C. W. Wood, Stockton, \$141,525.

SAN LUIS OBISPO COUNTY—Bet. Estrella River and Sacramento Ranch, 5.2 miles to be graded and surfaced with bituminous macadam. Dist. V, Rt. 33, Sec. B. Valley Paving Const. Co., Visalia, \$84,444. Contract awarded to A. Teichert & Sons, Inc., Sacramento, \$76,776.90.

SAN LUIS OBISPO COUNTY—About 1 mile north of Cambria, 1 mile to be graded and surfaced with screened gravel. Dist. V, Rt. 56, Sec. B. W. A. Dontanville, Salinas, \$11,488; W. J. Taylor, San Luis Obispo, \$12,588; Ariss-Knapp Co., Oakland, \$12,828. Contract awarded to Tiffany, Reynolds, Tiffany, San Jose, \$9,773.

SAN LUIS OBISPO COUNTY—Bet. Cuesta and 1½ miles south of Santa Margarita, 1.9 miles to be graded and paved with Portland cement concrete. Dist. V, Rt. 2, Sec. D. C. T. Malcom, Walnut Creek, \$107,376; Cornwall Const. Co., Santa Barbara, \$99,275; Prentiss Paving Company, San Jose, \$98,575; W. A. Dontanville, Salinas, \$99,929; Granite Const. Co., Watsonville, \$97,699. Contract awarded to M. J. Bevanda, Stockton.

SAN LUIS OBISPO COUNTY—Reinforced concrete girder bridge across Graves Creek about 2 miles south of Templeton. Dist. V, Rt. 2, Sec. B. John A. Webster, Lodi, \$12,663; C. C. Gildersleeve, Felton, \$11,534; San Atos Const. Co., San Luis Obispo, \$11,316; Theo. M. Maino, San Luis Obispo, \$39,340. Contract awarded to William Lane, Paso Robles, \$10,977.50.

SAN LUIS OBISPO COUNTY—At Yerba Buena Creek, just north of Santa Margarita, 0.2 of a mile of grading and crushed stone surfacing and one timber bridge. Dist. V, Rt. 2, Sec. C. E. D. Jarvis and W. H. Porter, San Luis Obispo, \$10,007; W. J. Taylor, Palo Alto, \$10,347. Contract awarded to M. J. Bevanda, Stockton, \$9,608.30.

SHASTA COUNTY—About 5 miles south of Castilla, a reinforced concrete girder bridge across Mears Creek. Dist. II, Rt. 2, Sec. D. J. P. Brennan, Redding, \$26,237; E. M. and Edgar Noble, Marysville, \$25,990; Lord and Bishop, Oroville, \$26,110. Contract Carlson Bros., Turlock, \$19,978.98.

SISKIYOU COUNTY—Bridge across Shasta River about 5 miles north of Yreka. Dist. II, Rt. 3, Sec. C. R. B. McKenzie, Gerber, \$31,798; Lord & Bishop, Oroville, \$31,020; George J. Ulrich Const. Co., Modesto, \$34,612. Contract awarded to M. B. McGowan, San Francisco, \$29,411.25.

SISKIYOU COUNTY—Bet. the Klamath River and the Oregon line, 14.5 miles to be treated with bituminous surfacing. Dist. II, Rt. 3, Sec. C. George French, Jr., Stockton, \$17,332; J. C. Compton, McMinville, Ore., \$18,294. Contract awarded to Jack Casson, Hayward, \$13,903.50.

TEHAMA AND SHASTA COUNTIES—Near Cottonwood, a reinforced concrete girder bridge across Cottonwood Creek. Dist. II, Rt. 3, Sec. C-A. M. B. McGowan, San Francisco, \$171,937; Healy-Tibbitts Const. Co., San Francisco, \$188,580; G. W. Kitchen, San Francisco, \$223,528; Lord and Bishop, Oroville, \$184,821; George J. Ulrich, Modesto, \$174,225; Rocca & Coletti, San Rafael, \$199,388; E. B. Skeels, Roseville, \$213,403; Northwest Contracting Co., Portland, \$176,860; Pan Pacific Piling and Const. Co. Los Angeles, \$168,234. Contract awarded to Badenhamer Const. Co., San Diego, \$159,827.

Road Financing in Other States

State highway financing occupied the attention of a number of state legislatures this year.

South Carolina has increased its gas tax from 5 to 6 cents, Indiana and Montana from 3 to 4, Kansas and North Dakota from 2 to 3. South Carolina and Arkansas have both voted to borrow money for enlarged construction programs.

The Arkansas legislature has authorized state expenditures of \$65,743,166.70 for highways during the next two years. A higher license and a 5-cent gas tax will bring \$22,000,000 for the biennium and federal aid \$2,500,000. The balance will come from sale of "highway notes."

The South Carolina legislature voted to issue \$65,000,000 bonds for a four-year highway construction program. Gas and auto taxes will be used to retire the bonds.

The Iowa legislature is working on plans to keep the road program in that state going. The \$100,000,000 bond bill adopted by the voters last November has been held unconstitutional.

Recent gas tax increases leave the roll of states as follows:

Six cents, one state: South Carolina.

Five cents, six state: Arkansas, Florida, Kentucky, Mississippi, New Mexico, Virginia.

Four cents, fourteen states: Alabama, Arizona, Georgia, Idaho, Indiana, Louisiana, Maine, Maryland, Montana, Nevada, New Hampshire, North Carolina, South Dakota, West Virginia.

Three and one-half cents, Utah.

Three cents, fifteen states: California, Colorado, Delaware, Iowa, Kansas, Michigan, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Tennessee, Texas, Vermont, Wyoming.

Two cents, nine states: Connecticut, Massachusetts, Minnesota, Missouri, Nebraska, New Jersey, Rhode Island, Washington, Wisconsin. Also the District of Columbia.

WISCONSIN—Many patrol sections on state gravel roads are to be shortened to permit more intensified maintenance. Fifteen miles is considered the maximum that a motor patrol outfit can cover and keep down "washboards." The state employed 980 patrolmen during 1928.

"In trouble?" asked a passing motorist of a couple in a coupe beside the road on a moonlight night.

"Nope," came the reply, "in love."

"Well, it's the same thing." And the interrupting motorist drove on.

STATE HIGHWAYS IN CALIFORNIA SHOWING THE PRIMARY AND SECONDARY ROAD SYSTEMS AND THE DIVISION OF THE STATE UNDER THE BREED BILL.



California Highways and Public Works



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State of California

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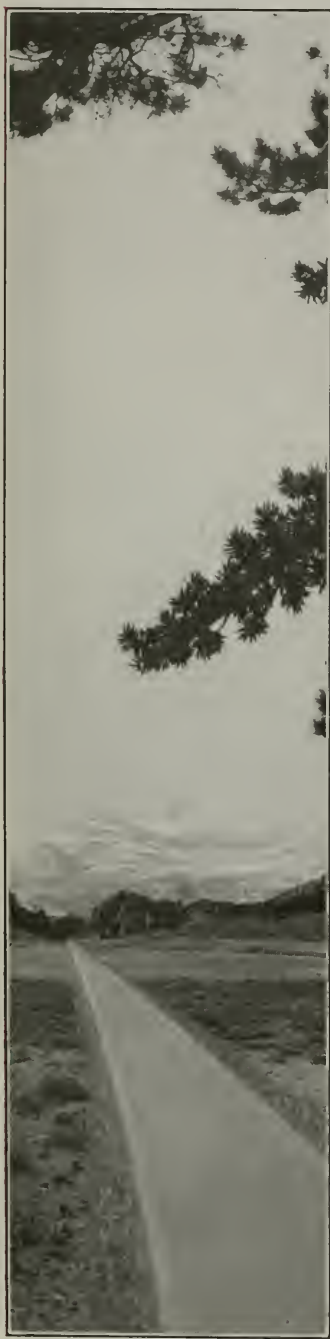


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This issue of CALIFORNIA HIGHWAYS AND PUBLIC WORKS includes in its contents articles dealing with the activities of all the divisions of the Department of Public Works. This is in accordance with the statute passed by the last legislature and approved by Governor C. C. Young, which became effective August 14, 1929. Succeeding issues of CALIFORNIA HIGHWAYS AND PUBLIC WORKS will carry similar matter.

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Travel Count Indicates Double Present Highway Traffic by 1940

THE volume of traffic on state highways has increased at the rate of 9 per cent annually for the past five years. If this rate continues to hold until 1940, the Division of Highways will be expected to maintain the roads for twice the present volume.

The biannual count of traffic was taken on July 14th and 15th throughout the entire state highway system. This count has been made on the Sunday and Monday nearest the middle of January and of July for the past five years. The check is made between 6 a.m. and 10 p.m. each day. For purposes of analysis the vehicles are segregated by hourly periods under the following classifications: passenger cars, light trucks, heavy trucks, trailers, buses, and horse-drawn vehicles. During the recent census 956 separate stations were recorded.

A comparison of the July 1929 count with that of July, 1928, shows the following increases:

	<i>For Sunday per cent</i>	<i>For Monday per cent</i>
Main north and south routes-----	5.0	5.0
Laterals between inland and coast routes -----	5.0	7.0
Interstate connections-----	16.0	19.0
Recreational -----	31.0	31.0
Average all routes-----	8.9	9.6

The gain or loss for a particular route expressed in percentage shows a considerable variation in several instances. This is accounted for, in the main, by the fact that construction work was under way either last year or during the recent count. The average of all stations, however, should give a dependable figure as traffic diverted from one route seeks the nearest outlet.

Gain or loss in count shown expressed as a percentage of the July, 1928, count for all state highway routes is as follows:

Rt. No.	Description	Sunday		Monday	
		gain	loss	gain	loss
		per cent	per cent	per cent	per cent
1	Sausalito-Oregon Line-----	19.0		32.3	
2	San Francisco-San Diego-----	7.2		13.3	
3	Sacramento-Oregon Line-----		19.0*		24.1*
4	Sacramento-Los Angeles-----	2.3			3.9
5	Stockton-Santa Cruz-----	4.5		11.2	
6	Sacramento-Woodland Jct-----		3.9		.7
7	Tehama Jct.-Benicia-----		2.9	12.3	
8	Ignacio-Cordelia-----		2.2		19.2
9	San Fernando-San Bernardino-----	1.4		4.1	
10	San Lucas-Sequoia National Park	13.4		11.1	

Rt. No.	Description	Sunday		Monday	
		gain	loss	gain	loss
		per cent	per cent	per cent	per cent
11	Sacramento-Riverton-----	8.3			4.4
12	San Diego-El Centro-----	56.9		63.6	
13	Salida-Sonora-----	4.6			4.6
14	Albany-Martinez-----	10.0		7.4	
15	Rt. 1 near Calpella-Grass Valley--	21.7		34.8	
16	Hopland-Lakeport-----		3.5	7.1	
17	Roseville-Nevada City-----		23.2		11.3
18	Merced-El Portal-----		2.1	8.2	
19	Rt. 9 West of Claremont-Riverside	18.3			3.0
20	Redding to Rt. 1 near Arcata-----		25.2	26.0	
21	Rt. 3 near Richvale-Quincy-----	55.3		46.6	
22	San Juan Bautista-Rt. 32-----	7.2		15.8	
23	Saugus-Bishop-----	1.4		3.7	
24	Rt. 4 near Lodi to Valley Springs		.06		4.7
25	Nevada City-Downieville-----	26.7			5.4
26	San Bernardino-El Centro-----	20.0		23.3	
27	El Centro-Yuma-----	40.5		23.5	
28	Redding-Nevada Line-----	26.3		26.5	
29	Red Bluff-Nevada Line-----	29.4		21.7	
31	San Bernardino-Jean-----		3.0	9.5	
32	Rt. 4 near Califa-Rt. 2 at Gilroy	7.7		11.5	
33	Rt. 4 near Bakersfield-Paso Robles	79.1		90.6	
34	Rt. 4 near Arno-Pine Grove-----	4.5			4.2
35	Peanut-Kuntz-----		20.8	23.0	
37	Auburn-Colfax-----	18.8		12.3	
38	Meyers-Nevada Line-----	18.6		46.9	
39	Tahoe City-Nevada Line-----		62.2		61.4
40	Rt. 13 near Montezuma-Rt. 23 Mono Lake-----	48.0			4.7
41	West and East of Hume-----	105.4		161.2	
42	Saratoga Gap at Redwood Pk. Gate	181.8		542.2	
43	San Bernardino-Big Bear Lake-----	7.4		11.2	
44	Boulder Creek-Redwood Park-----	8.7		5.3	
45	Willows-Rt. 3 N. of Biggs-----	12.6		6.9	
46	Rt. 1 near Klamath River-Rt. 3 near Cray-----		14.2		5.1
47	Oriand-Chico-----	14.3			1.6
48	McDonalds-Wendling-----	30.0			2.2
49	Calistoga-Lower Lake-----	8.8		14.2	
51	Santa Rosa-Schellville-----		4.1	32.9	
52	Alto-Tiburon-----		7.7	4.6	
53	Fairfield-Lodi-----	19.2		20.1	
54	Near Michigan Bar-Central House	105.4		136.1	
55	San Francisco-Spring Valley Dam	64.8		68.5	
56	S. of Carmel Interx of Carmel Valley and Big Sur Roads-----	24.9		12.4	
57	Santa Maria-Bodfish-----	10.6		28.3	
58	Mojave-Topoc-----	5.0		12.8	
59	Lancaster-Baileys-----	4.8			5.6
60	El Rio-San Juan Capistrano-----	40.4		71.2	
61	La Canada-Mt. Wilson Rd-----	9.5		31.4	
63	Big Pine-Oasis-----		1.4		22.2
64	Mecca-Blythe-----		28.6		15.8
65	Anuburn-Sonora-----	17.0		8.6	
66	Manteca-Rt. 5 nr. Mossdale School		32.5		42.0
67	Pajaro R.-Rt. 2 near San Benito River Bridge-----	9.0		3.5	
68	San Francisco-Burlingame-----	35.2			51.1
69	San Quentin Road-----	10.2		33.8	
70	Ukiah Jct. Rt. 1-----	21.5		4.7	
71	Crescent City-Oregon Line-----	24.1		32.5	

* The decrease shown on route 3 due to construction work which closes the heavily traveled portion of the road.

The actual number of vehicles passing each individual station follows:

TRAFFIC CENSUS					
July 1928, and 1929					
Count 6 a.m. to 10 p.m.					
Route 1. Sausalito to Oregon Line					
District IV					
		July, 1928		July, 1929	
		Sun.	Mon.	Sun.	Mon.
		15	16	14	15
Station location					
Sausalito to Ferry Bldg-----				495	267
Sausalito, Hyde Street Ferry----				11,154	4,111

(Continued on page 28.)



Melones Dam on Stanislaus River.

The New Division of Water Resources

THE LAST legislature created a new division of the Department of Public Works to be known as the Division of Water Resources. This division is directed by the State Engineer and embraces all activities in the department pertaining to water, water rights, irrigation districts, hydraulic investigations, dams, flood control and reclamation, and includes all work under the former Divisions of Water Rights, and of Engineering and Irrigation as well as important new duties delegated by the 1929 legislature.

The work of the new Division of Water Resources classifies itself naturally into five subdivisions, as follows: Water rights, Water resources investigation, Irrigation districts, Dams and flood control and Reclamation, and the organization of the division has been set up to place a deputy state engineer in charge of each of these main divisions with the exception of irrigation districts which are vested in the State Engineer personally.

The act establishing the Division of Water Resources became effective August 14th last and on this date the Director of Public Works appointed Edward Hyatt State Engineer and the following deputies:

Harold Conkling in charge of water rights.

A. D. Edmonston in charge of water resources investigation.

R. L. Jones in charge of flood control and reclamation.

J. J. Haley, Jr., administrative assistant.

FORMER DIVISIONS CONSOLIDATED

The work of the Division of Engineering and Irrigation and the Division of Water Rights has been somewhat along parallel lines for about 10 years and the consolidation of these offices has been considered at several times during this period but was not deemed desirable until the 1929 legislature met. The reason for this was that the water rights situation in California in 1913, when the Water Commission was created, was in an extremely confused and unsatisfactory condition. This was due among other causes to the fact that there was no central state authority, so that until the last few years the work of the Division of Water Rights has necessarily been to some extent exploratory in investigating past court decisions and water law and in setting up and standardizing methods of operation. This work being so specialized has made it inadvisable to combine the two offices heretofore. However, procedure is now well established



EDWARD HYATT.

by experience and precedent and the time for consolidation has come.

A study of the work of the two divisions and the possibility of consolidation indicates clearly that such combination can now be made, not only with economy to the state but

with better service to the public dealing with water matters. Duplication of effort in dealing with two state offices on water matters will be eliminated under the new division and a more effective administrative set-up, as well as a more economical one, will be the result.



J. J. HALEY.

NEW DUTIES ADDED

In addition to the work of the two former divisions the new Division of Water Resources has been delegated new duties. A state-wide investigation of water resources has been going forward intermittently under the Division of Engineering and Irrigation since 1921 and the result, an incomplete report on this subject, has been given close attention by the state and by the 1929 legislature. The action of the legislature was to direct a further intensive investigation of the whole subject of water resources and the preparation of a state-wide plan for submission to the 1931 legislature and appropriations to carry on this work were made. To make the investigations and report in the limited time allowed will require a great amount of hydraulic research within the next sixteen months and this work will be done by the Division of Water Resources.



R. L. JONES.

ration of a state-wide plan for submission to the 1931 legislature and appropriations to carry on this work were made. To make the investigations and report in the limited time allowed will require a great amount of hydraulic research within the next sixteen months and this work will be done by the Division of Water Resources.

SUPERVISION OF DAMS

A second item of state-wide importance is the supervision of dams. The legis-

lature placed in the department, to be exercised through the State Engineer, authority over all dams in the state over a minimum size and height with directions to check up and approve all dams now existing, to supervise construction of new dams and to supervise operation and maintenance of all dams. There are more than 500 dams now existing in California over the minimum size. An appropriation was made to carry on this work during the next two years.

FLOOD CONTROL

The work of the division in connection with flood control and reclamation is also of considerable importance and will be increased through a state and federal program on the Sacramento-San Joaquin Flood Control Project.



A. D. EDMONSTON.

RIVER

RECTIFICATION

Bank protection and river rectification work throughout the state are under the direction of the division, a small fund being available to take care of such work on a cooperative basis. Maintenance of the Sacramento Flood Control Project is delegated to the division as well as new construction activities on the project under state direction. For the next

two years this will comprise an extensive program.

Irrigation district activities, while possibly not as large as a few years ago, are of the greatest importance to the state. Irrigation districts in California are under close supervision by the State Engineer's office and bond issues by such districts are under the supervision of the California Bond Certification Commission, consisting of the Attorney General, Bank Superintendent and the State Engineer.



HAROLD CONKLING.

(Continued on page 21.)

The California Highway Patrol

By FRANK G. SNOOK, Chief of the Division of Motor Vehicles

PRIOR TO 1923, various methods and systems of enforcing traffic laws and regulating traffic were employed in the counties of California. In some, special officers operated under the district attorney, in others under the sheriff, and still others under the board of supervisors.

Early that year, while the legislature was in session, the Supreme Court handed down a decision in the case of *Logan vs. Shields*, the practical effect of which was to prevent counties from employing traffic officers under existing county government acts.

AN EMERGENCY ACT

Traffic enforcement was in a chaotic condition for a time. Then, as an emergency proposition, the legislature passed an act empowering the chief of the Division of Motor Vehicles to enter into contracts with the various boards of supervisors to employ traffic officers, such officers to be paid out of the counties' share of motor vehicle registration receipts.

While this new system was workable to a certain degree, it was highly unsatisfactory as actual practice proved. About twenty counties entered into contract at once with the division, but several others refused to do so. Some entered into contracts for a time and then withdrew. There was the constant danger of friction.

SERVED TWO MASTERS

Meanwhile traffic officers were put in the position of trying to serve two masters. Double-headed authority existed and the officers did not know whether to take orders from the supervisors who actually appointed them and fixed their salaries or the state officials who supervised their work.

If a county decided to withdraw from the system, the law was so ambiguous that the state was without authority to put its own men in. There was a lack of uniformity in traffic enforcement. Every county paid a different salary for its officers. The men could not be moved from one county to another. In some sparsely-settled mountain counties the receipts from motor vehicle registrations were so small that there was insufficient money to employ officers.

With these conditions in mind, we decided to draft a bill that would put the state in



FRANK G. SNOOK.

direct and undisputed control of the traffic officers. Meanwhile public sentiment had crystallized in favor of the change so that when the measure was placed before the legislature it carried the endorsement of the supervisors, the development and safety groups, the labor bodies and practically every other interested group. This sentiment was reflected in the legislature and the bill was passed with almost no opposition.

The measure received the enthusiastic support of Governor C. C. Young. In signing it he issued a statement characterizing the bill as "one of the most constructive pieces of legislation passed by the legislature."

GOVERNOR FOR BILL

"It is not an untried experiment," said Governor Young, referring to the statewide patrol features of the new act. "It has been tried out in several states and has attained a notable success."

The new act authorized the following:



EUGENE W. BISCAILUZ.

1. Creation of the California Highway Patrol, to be administered by the Division of Motor Vehicles, subject to the approval of the Director of the Department of Public Works.

2. Appointment of a superintendent of the patrol and his assistants by the division chief, subject to the approval of the Director of Public Works, and the reappointment of all existing traffic officers operating in the counties for a probationary period of one year.

3. Establishment of training schools for officers of the patrol, creation of traffic districts in the organization of the patrol, establishment of night patrols and all other organization details necessary to put the state force on a high plane of efficiency.

PUT ON PROBATION

Under this arrangement, inspectors, captains and traffic officers, operating in the various counties, attain a civil service status after the probationary period of one year. Thereafter they will be rated in efficiency in accordance with the civil service act.

The new law provides that, whenever vacancies shall exist in the patrol, the supervisors of the county in which the vacancy occurs shall submit a list of prospective appointees for the place who shall take civil

service examinations. In the event of failure on the part of the supervisors to submit such a list, the division files its own list of candidates for the place with the Civil Service Commission.

AUTHORITY UNDIVIDED

This arrangement assures the cooperation and good will of the supervisors without endangering the principle of undivided and undisputed authority of the state organization.

Special authority is provided in the law for moving officers from one county to another in case of emergency, the single restriction being that an officer may not remain outside his home county for more than a week without the consent of the supervisors.

We are now engaged in the organization of the patrol and are well advanced in the details.

A first step was the appointment of a superintendent. This matter was given weeks of constant study, and the field of prospective candidates was well combed before a selection was made.

BISCAILUZ MADE PATROL HEAD

In the appointment of Eugene W. Biscailuz, former undersheriff of Los Angeles County,

(Continued on page 13.)

MOTORISTS OF STATE WELCOME TEST OF THEIR MOTORING KNOWLEDGE

Californians do not desire exemption from examination for operator's licenses. To the contrary motorists welcome a test that will reveal their knowledge of the laws and practices governing the operation of motor vehicles.

This is the statement of Frank G. Snook, Chief of the Division of Motor Vehicles. It is based on the fact that less than ten requests have been received for exemption from the tests for operator's license.

This is particularly significant when the number of motorists involved is considered.

Since July 11, 1929, Division of Motor Vehicles now a part of Department of Public Works, has been engaged in giving operators examinations to all applicants whose operators license were issued prior to January 1, 1927. Up to and including August 23, 1,169,908 licenses were issued following the examination of applicants. Since January 1, 1927 and up until the time the examination began a total of 1,065,712 licenses have been issued. Accordingly there were on that date an approximate total of 2,235,680 licenses in the state that are now legal. Excellent cooperation in giving these examinations has been extended by police officials in various cities.

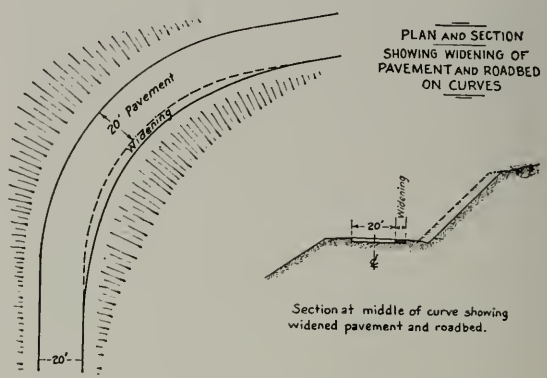
Curve Widening Program is Adopted

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THE Division of Highways has recently adopted the policy of widening the pavement and roadbed on all curves having radii of less than 500 feet. The widening which is applied to the inside of the curves, varies from a minimum of two feet for curves of 400-foot radius or greater to a maximum of four feet for curves of 200-foot radius or less. The transition from normal unwidened roadway to fully widened roadway is made in a distance of approximately 80 feet. In every case the pavement edges follow mathematically precise curves which insure pleasing appearance and are easy to lay out.

The widening policy has been adopted in line with the best modern highway engineering practice in an effort to build into California roads the maximum degree of safety, ease and riding efficiency. Curve widening is being practiced in various forms by a number of highway organizations usually, however, in connection with sharper curves and narrower roadbeds than are used on modern state highways. With the general adoption of the 10-foot width for single traffic lanes, 20-foot width for two-lane pavements, wide shoulders, moderate speed limits, and definite restrictions of vehicle dimensions, curve widening seemed unnecessary. In the last year or two, however, speed limits throughout the country have undergone decided upward revision in response to popular demand.

A properly aligned and superelevated curve produces at reasonable safe speeds, little or no steering effort or swerving sensation. A passenger riding with eyes closed should be practically unable to distinguish between straight and curved road. Various driving tests indicate that on properly superelevated curves of about 1000-foot radius or more a car can be guided safely without appreciable effort at any practical speed within a 10-foot traffic lane. On curves of from 500- to 100-foot radius the steering effort and sensation of curving become appreciable and speed restriction is often necessary on the shorter radii if the driver is not familiar with the road. On curves of less than about 500-foot radius speed restriction is necessary and there is a definite lurching effect at high speeds due to the sudden change from straight to curved progress. A too sudden change from a



straight to a curved path is productive of accidents. The change in direction should be accomplished gradually to avoid the lurching and weaving tendencies. It is to assist in this easier change of direction and to eliminate as much as economically possible the hazard which the sharp curve presents, that the widening of roadbed and pavement are introduced.

Standard widening as applied to California highway curves modifies or overcomes the tendencies encountered on the sharp curves within practical limits and provides greater safety and driving ease in the following ways:

1. Sight distance is increased, which adds to safety.
2. With the aid of a traffic stripe 10 feet from and parallel to the inside edge of the pavement, traffic in both lanes is directed along a path which corresponds closely to a parabolic transition between straight line and curve. The approximate length of 80 feet for the widening transition was selected carefully with a view to securing a combination of the most natural, convenient, and economical transition for average, reasonable, practical speeds. Safety and driving ease are thereby increased.
3. In case a car traveling at excessive speed does lurch, additional passing room is provided on the outside of the curve, toward which the car will swerve. The additional width allows more room for maneuvering the car and so adds safety.
4. Greater clearance, with increased safety and beneficial psychological effect, is provided between passing vehicles of unusual width.

(Continued on page 9.)

Clippings, Letters and Comment

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THE MILLION yard job on the Bayshore Highway just south of San Francisco bids fair to shine forth as one of the most extensive undertakings on highway work in the state. This job is only 3.5 miles long, but it embraces many types of construction and each in a big way. A long reinforced concrete arch underpass for a railroad spur track to Visitacion Valley through lands of the Crocker Estate, costing about \$40,000; a 65,000 rubble masonry retaining wall, a double 8-foot by 9-foot reinforced concrete box culvert 100 feet long, placed on piles, the care of a 44-foot water main of the Spring Valley Water Company involving a 500-foot tunnel and a \$17,000 wooden suspension bridge over a slide; 805,000 cubic yards of roadway excavation with 150,000 cubic yards of slides and a probability of as much again; a 7-inch bituminous macadam pavement 40 feet wide and much culvert sewer and right of way problems, make this project an outstanding piece of engineering.

But, anyone using the completed portion south of South San Francisco, may easily see that the expenditure of this vast sum is warranted to complete this link of a coming great highway. It is hoped to construct hard pavement on this highway soon, as the heavy traffic is making maintenance costs on the temporary pavement almost prohibitive.

* * * * *

Saving Trees Along the Highways.

The Stockton *Record* editorializes as follows:

It was gratifying to be assured by R. E. Pierce, district engineer of the Highway Commission, that the state program for the widening of Cherokee Lane will not interfere with the shade trees along that heavily traveled thoroughfare. A survey has been made, he declared at last night's meeting here, and it was found that only a few straggling trees would have to come down.

Although the state desires a 100-foot right of way, he explained, the roadbed will only be 40 feet wide, with four 10-foot traffic lanes and 8-foot parking spaces on the sides. This will not interfere with the trees, the engineer indicated.

The local people want their highways to be wide enough and adequate to handle our constantly increasing traffic but they also want the trees, which mean so much in the way of comfort and beauty, spared if at all possible.

Planning For Proper Width of Highway.

This from the Pasadena *Star News*:

It is evident that the vision of California's most ardent boosters of a quarter of a century ago was not broad enough. It is true that those faithful, far-seeing men and women sensed, with prophetic instinct, the coming of a remarkable period of development in this state. But the fulfillment is greater than the vision. This is seen in streets and highways. Not enough width has been provided for actual needs of traffic today, much less to meet the requirements of the expanding future.

Favored are those municipalities which laid out broad streets—especially their main arteries. Other municipalities which did not use this foresight, are hastening to make up for their remissness. Many street widening projects are in progress in different cities and towns of the state.

And the same as to highways. There has been widening of state and county highways over long stretches of mileage. In some instances the second widening in a few years is being made. The State Highway Commission is urging that future highways should be planned 80 feet wide, to take care of the amazing growth in volume of high-road traffic.

Eighty feet is conservative. It will not be long until highways 120 feet wide will be required, and even 200 feet may be demanded in main arteries lead to and from big centers of population.

California, the truth is, faces such phenomenal development that even the wisest and farthest-sighted can not lay down now exactly what the near future may require.

* * * * *

Federal Aid Given to 7022 Miles of Road.

During the fiscal year 1929, the federal government cooperated with the states in the improvement of 7022 miles of federal-aid highways, bringing the total mileage of the system improved with federal aid to 78,096, according to figures of the Bureau of Public Roads of the United States Department of Agriculture. The year's mileage was improved in the 48 states and Hawaii by state highway departments working in cooperation with the federal bureau. There are approximately 188,000 miles of main interstate and intercounty highways in the federal-aid system, of which the above mileage and approximately an equal mileage built by the states without federal assistance is now improved.

* * * * *

Highway Maintenance Men Also Fire Fighters.

A big emergency fire-fighting force was placed at the command of State Forester M. B. Pratt under the terms of a cooperative agreement signed by the State Department

of Public Works and the Department of Natural Resources.

By provisions of the agreement, maintenance crews of the highway will be subject to call by state rangers at all times for combating fires in and adjacent to highway rights-of-way, according to Fred G. Stevenot, State Director of Natural Resources.

The highway workers, it is provided, shall work under the command of the forest ranger or inspector in charge of the fire until relieved. The Department of Public Works has further agreed that its highway maintenance men, when they discover a fire near their work, shall independently take charge of its suppression until members of the state fire patrol reach the scene of direct operations.

Salaries of the maintenance men while employed in fighting fire will be paid by the state forest service, except where the blaze was caused by highway maintenance operations, when the costs will be defrayed by the Highway Commission.

"This agreement," said Stevenot, "is another fine example of practical cooperation between state agencies, made possible by the coordination of state departments and closer relationships that have resulted from Governor Young's cabinet of department chiefs."

* * * * *

Has New Suggestion For Interstate Signs.

More courtesy in interstate highway signs, is the suggestion made to the Department of Public Works by E. V. King of Sacramento, who writes as follows:

Permit me to submit, for your consideration, the following suggestions outlined as briefly as possible:

There seems to be, and I suppose always will be, a friendly rivalry among states which at times reaches a stage that could hardly be called friendly, especially in neighborhoods of adjacent boundary lines.

California's magnanimity would be accentuated by her primary step to change this feeling to one of high respect from its neighbors which would ultimately spread to other states creating good will and higher respect for each others prerogatives. In other words doing a good turn and having it found out by accident assures its own reward.

To bring about the desired effect let us suppose you motor to Nevada, crossing the state line you will see a sign reading "Nevada" on one side and "California" on the other with several apathetic uninteresting notices what you should or should not do, which of course is very necessary but would fail to impress you and consequently you would journey on without another thought.

Suppose on your return you saw a beautiful, massive sign or arch reading on the Nevada side:

THE WESTERN GATE
OF A SILVER STATE
TO ITS GOLDEN MATE
CALIFORNIA

REMAINS FOUND OF PREHISTORIC SHARK IN STATE HIGHWAY CUT

Remains of prehistoric animals have been uncovered in a large cut, 60 feet in depth, now being excavated on a section of state highway in Kern County. This cut is being handled by hydraulic methods, the material being washed into the fill without the use of any grading equipment. A dragline clears the channel of rocks and boulders. The deposit of the remains of prehistoric animals includes a number of teeth, which savants declare came from a prehistoric shark. These teeth are in a remarkable state of preservation, some having a perfect enamel with no scars or blemishes.

and on the California side:

THE EASTERN GATE
OF A GOLDEN STATE
TO ITS SILVER MATE
NEVADA

The tourists traveling the Santa Fe Trail could be pleasantly greeted while entering Arizona from California with:

ARIZONA
WHERE THE DESERT MOON CASTS A
MYSTIC GLOW ON THE SILHOUETTE
OF A NAVAJO

Entering from Arizona into California one could read:

CALIFORNIA
WHERE GOD HIMSELF A GARDEN BUILT
AND ALL THE POPPIES TINGED WITH GILT

A similar sign with appropriate inscriptions could be established on our northern gateway into Oregon. I believe these gateways would become the talk of the nation.

* * * * *

Protective Work Wins Editorial Commendations.

The following editorial is from the columns of the *Imperial Valley Press*:

Travelers from the valley to Los Angeles by auto, who wondered why the state was spending money erecting huge mounds of earth along the highway beyond Kane Springs, had the answer given them in Sunday's storm.

Practically useless the greater part of the year, the flood protection system built by the State Highway Commission proves its worth in a single day when the wild waters rush down through gorges and the dry desert becomes an inland sea.

In former years such an occurrence played havoc with automobile traffic to and from the valley on the Salton Sea route. Sunday's storm, thanks to the protective system, did little or no damage to the highway. The railroad, without such protection, is placed out of commission.

People who have never seen it, can not imagine the force and fury of these desert torrents which are

created in a minute, rush wildly on their course, sweeping all in their path, and disappear as quickly as they start, leaving costly damage in their wake.

The highway flood protection system is worth every cent it cost, even if its only benefit is to prevent a huge repair bill on the highway. The fact that it also prevents loss of time in transporting people and merchandise is additional justification for its construction.

* * * * *

Ban Peddlers From Highway Right of Way.

The Venice *Vanguard* publishes this article:

The state highway between Santa Monica and Oxnard is not to be fringed with a line of peddlers vending everything from peanuts to firewood.

This was the decision given yesterday by Justice of the Peace John L. Webster of Malibu township, who presided at the trial of a man arrested Sunday evening near Topanga Canyon for selling firewood from the coast road right of way.

Although Judge Webster did not inflict a penalty in this case, he warned that a second offense of this nature would be punishable, and reiterated the statement that it is against the law to use any portion of the state highway as a sales-stand, also stressing the fact that these stands add neither to the beauty of the scenery nor to the motoring public's safety.

* * * * *

Courtesy of Highway Employees Appreciated.

The following letter addressed to Commissioner Fred S. Moody comes from Ross A. Curran of San Francisco:

About a fortnight ago, I motored from San Francisco to Tallac on Lake Tahoe by way of Placerville and found the road, with a few exceptions, in that splendid well-kept state so characteristic of California highways. There were, however, as perhaps you know, places where the road was being widened or otherwise under repair. At all of these places regulation of traffic was not only expeditiously but most courteously handled, and I must confess to a pleasant astonishment when in every instance I was thanked by a director of traffic for submitting to the inevitable delay and which men obviously working under high pressure sought to make as short as possible.

To you and your associates on the Commission, I am prompted to offer this just tribute, and to express through you to your employees my appreciation of their attitude.

* * * * *

Applauds Work of Fire Protection.

S. Parker Frisselle, chairman of the San Joaquin Advisory Council of the California State Chamber of Commerce, writes as follows:

The effective work done this year by the Division of Highways, in the removal of fire hazards from state highway rights-of-way, has been an important step in the prevention of grass, grain and timber fires.

The San Joaquin Valley Regional Advisory Council of the California State Chamber of Commerce

wishes to express its deep appreciation for this vital work. We hope that you will be able to continue and to expand this effort in future seasons.

* * * * *

Cortelyou Lauds Cooperation of Santa Monica and Oxnard.

The following article is from the August 7 issue of the Santa Monica *Outlook*:

"A splendid example of intelligent legislation." Thus did S. V. Cortelyou, district engineer for the California State Highway Commission yesterday laud the action of Santa Monica's city commissioners in voting a setback ordinance that will in years to come make it possible to develop Lincoln Boulevard as an important link in the state highway system.

By actual check, Mr. Cortelyou explained, the Coast road in front of Santa Monica is the heaviest traveled state highway in California, with the prospect that the continued increase of this traffic will be limited only by facilities to care for it.

Under these conditions, the problem of the State Highway Commission is to find arteries for through travel that are so located as not to complicate still further the problem of congestion with which the local authorities must cope. In the selection of Lincoln Boulevard for this new highway route, Mr. Cortelyou believes that the Santa Monica commissioners have taken a very forward step, and one that should be followed immediately by the city of Los Angeles in voting a similar setback through Venice and the territory adjacent.

As explained by the state highway engineer, the importance of fixing the setback line for Lincoln Boulevard through Santa Monica to make it a 100-foot street later on is this:

The cost of improving a street remains about the same from year to year, but the cost of acquiring the necessary rights-of-way rises steadily and becomes almost prohibitive after permanent improvements are completed and property values begin to sky-rocket.

Questioned as to what the city of Oxnard had done to obtain such a wide and well-paved link of the Coast Highway through its limits, Mr. Cortelyou reported that Oxnard carried out this improvement without either state or county aid, and had not only paid for the main highway, but assumed a second assessment to create a parallel by-pass road connecting with the state highway at both ends of the city.

CURVE WIDENING PROGRAM IS ADOPTED

(Continued from page 6.)

The actual design of the widening is based on a careful study of modern contemporary practice and represents the best efforts of the engineers of the California Division of Highways to incorporate into their highway designs the maximum of safety and service for present and future automotive traffic, with due regard for the high speeds which almost surely will prevail in the future.

NATIONAL—Since 1916, Indian reservations have been given 568 miles of highway improvements at federal expense and 279 miles on a state cooperative basis, costing a total of \$10,500,000.

The Civil Service Candidate

As the Examiner Sees Him

By C. S. POPE, Construction Engineer

THE WRITER has had so many opportunities to observe the causes which operate to prevent candidates who take the State Civil Service examinations in highway work, from attaining the grades they seek, that a statement of these observations may be of advantage to future candidates. From time to time, during examinations, these causes have been jotted down, and may come under one or another of the following heads:



C. S. POPE

(1) Lack of study of the requirements as given in the Civil Service bulletins calling for the examinations.

(2) Lack of education.

(3) Lack of experience in construction.

(4) Lack of experience in executive control.

(5) Lack of study of the trend of highway construction.

(6) Lack of experience in surveying and the handling of field parties.

(7) Inability to explain to examiner the information which the candidate really has.

(8) Attempts to impress the examiner that the candidate was better informed or more experienced than he really was.

Many applicants who enter examinations do not read with sufficient care the Civil Service bulletins which outline the educational and experienced requirements which must be met before success may be attained in an examination. A study of the details of these bulletins would often prevent the candidate from attempting an examination for which he was clearly not qualified.

Lack of education may be of two kinds, the one technical and the other practical. Many men may have secured degrees at college who have done no additional studying since graduation, have done no studying particularly relating to highway matters, and have not in general kept themselves informed on the progress of highway work.

Many men enter engineering work in a junior capacity and apparently with the same

viewpoint toward their work that a laborer or tradesman has toward his job, and without realizing that they are taking a position as an assistant in a technical profession whose standards are being constantly increased. Success in engineering work depends upon a proper application of scientific laws, particularly those of physics, chemistry and mathematics. Many men who have entered engineering work without this fundamental training are disappointed because they fail of advancement, but are apparently unaware of their weakness or make no effort to correct it. This statement is not made with any intention of discouraging a man who may be without formal educational training, but who is willing to study and work to increase his fitness for the position he seeks. Many men in such condition have succeeded in attaining advancement to responsible positions and there are many very good correspondence courses, particularly those of the extension departments of state universities, by which they can profit.

Many candidates state that they have started a correspondence course but have discontinued their studies. It is realized that it is difficult to study under certain conditions, but study is certainly essential to progress.

Practical education would include a knowledge of practical highway construction and might be obtained either in the state highway organization or outside of it, but it is particularly essential if the candidate does not have a technical education to begin with. Many candidates fail to have a proper knowledge of design, nor do they seem to have made any study of the subject.

Lack of experience in construction or even observation of construction is often a cause leading to the elimination of the candidate. The ordinary types of construction with which candidates should be familiar are grading in both mountain and valley locations, rock surfacing, oiling, bituminous macadam, bridges or other concrete or timber structures, culverts, and the various types of pavements. Candidates often show a decided lack of knowledge of why structures are built as they are and of the reasons for the placing of

(Continued on page 15.)

Road Improvements Made Possible by New Contracts Awarded in August

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The following summary shows the award of contract from July 26th, to August 31st, inclusive, the sections to be improved under these contracts and the character of their improvement:

Stockpiling for Skyline Boulevard.

Tieslau Brothers, Berkeley.—Producing and stockpiling crushed gravel or stone screenings between La Honda Road and Saratoga Gap on the Skyline Boulevard. Contract price, \$18,245.

Surfacing for Victory Highway.

Meyer Rosenberg, San Francisco.—Application of bituminous surface treatment, 18 feet wide, on a section of the Victory Highway, 6.9 miles in length between Soda Springs and Donner Lake. Contract price, \$18,583.50.

Arrowhead Trail Project.

George Herz & Company, San Bernardino.—Grading and surfacing with oil-treated crushed gravel or stone, a section of the Arrowhead Trail, 13 miles in length, between Barstow and 1 mile east of Yermo. This project begins at the north end of Barstow and connects at its eastern end with the project under construction 1 mile east of Yermo. Contract price, \$169,695.85.

Tahoe-Southern California Improvement.

Fred W. Nighbert, Bakersfield.—Grading a roadbed 36 feet in width and placing a surfacing of oil-treated crushed gravel or stone 20 feet wide on the section of the route between Lake Tahoe and southern California, via the eastern side of the Sierras. This contract is in Inyo County between the southerly county boundary line and Little Lake, and is 9.8 miles in length. Contract price, \$111,920.10.

Golden State Highway Project.

Valley Paving and Construction Company, Visalia.—Grading roadbed 36 feet wide and widening and resurfacing the existing 15 feet of cement concrete base with asphaltic concrete 20 feet in width, on a section of the Golden State Highway, also known as the Valley Route. This section is in Tulare County between its southerly boundary and Pixley, and is 12.2 miles in length. Contract price, \$287,674.

Lilly-Willard and Biasotti of Stockton.—Grading and surfacing with untreated crushed gravel or stone, 20 feet in width, a section on the main Valley Route, between a point 2.5 miles north of Turner Station and the Mariposa Road, in San Joaquin County. This section is 1.1 miles in length. Contract price, \$30,428.

Widening With Rock Borders.

Smith Brothers, Eureka.—Widening with oil-treated rock borders a section of the Napa Valley Route, 5.3 miles in length, between Napa and Greenwood Corner. Contract price, \$14,772.50.

New Bridge on Tahoe Route.

Lord and Bishop, Oroville.—A reinforced concrete girder bridge across Tallac Creek in El Dorado County, on the Placerville-Lake Tahoe Route. Contract price, \$8,848.50.

Eliminating Four Curves.

Fredrickson and Watson and Fredrickson Brothers, Oakland.—Grading roadbed 34 feet wide and surfacing with bituminous macadam 20 feet on a section 3.1 miles in length between Napa Wye and the Solano County line. This improved alignment will eliminate three sharp curves and one reverse curve. Contract price, \$69,004.60.

Revision of Alignment.

Matich Brothers, Elsinore.—Grading and paving with Portland cement concrete 0.7 mile in Orange County, between Serra and San Juan Capistrano. The roadbed is to be 40 feet wide and pavement 20 feet wide. This project is a revision of alignment and replaces five short radius curves with two curves of longer and safer radii. Contract price, \$31,751.

Improving Surface.

M. J. Bevanda, Stockton.—Constructing bituminous macadam surfacing at different locations between Los Alamos and a point on the Coast Highway 6.5 miles north of that place. Contract price, \$11,551.90.

W. A. Dontanville, Salinas.—Constructing bituminous macadam surfacing from a point about 7 miles north of Salinas to San Juan, about 2.4 miles altogether. Contract price, \$9,909.

Rose Canyon Work.

R. E. Hazard Contracting Company, San Diego.—Grading 5.4 miles between Balboa Avenue and Torrey Pines road to a roadbed width of 46 feet. This section will be a part of the main line route between San Diego and Los Angeles, and is generally known as the Rose Canyon Route. It constitutes an improvement of the present traveled way via La Jolla and shortens the distance 4.5 miles. Contract price, \$106,830.80.

De Waard & Sons, San Diego.—Reinforced concrete girder bridge across Rose Canyon in San Diego consisting of seven 30-foot spans. Contract price, \$30,515.

Opens Recreational Areas.

H. W. Rohl Company, Los Angeles.—Grading 24-foot roadbed on a section of the Arroyo-Seco Highway in Los Angeles County, between La Canada and a point 2.2 miles northerly. The project includes a large amount of reinforced concrete cribbing to hold the banks on steep mountain slopes. This section is a part of the Arroyo-Seco road, climbing up from the canyon to the ridges in the high country above Pasadena. It will open up additional recreational regions. Contract price, \$244,532.40.

Macadam Surfacing, Rock Borders.

J. E. Johnston, Stockton.—Placing bituminous macadam surfacing over present cement concrete pave-

ment and placing rock borders on each side of pavement, for a total length of 11.3 miles between Roseville and one-half mile north of Andora subway in Placer County; between Dry Creek and Morrison's Crossing in Yuba County; between Bretana and Dunnigan in Yolo County; between Geneva (Berlin) and a point 2.6 miles north, in Colusa County. Contract price, \$58,700.

Graveling Surface.

Hemstreet & Bell, Marysville.—About 3.5 miles of gravel to be spread on a section of the Oroville-Willows lateral between a point one-half mile west of Butte City and the Chico road in Glenn County. The gravel is to be treated with fuel oil. Contract price, \$5,652.50.

Redwood Highway Improvement.

Heafey-Moore Company, Oakland.—Surfacing with bituminous macadam a section of the Redwood Highway between Mill Creek and Trinidad, 10.6 miles in length in Humboldt County. The surfacing is to be 20 feet wide over the present crushed rock surface. Contract price, \$38,564.50. (Rock and oil to be furnished by state.)

Heafey-Moore Company, Oakland.—Surfacing with bituminous macadam 20 feet wide over existing crushed rock surfacing 14.9 miles between one mile south of Orick and the northerly county boundary of Humboldt County. Contract price, \$62,445.

J. C. Compton, McMinnville, Oregon.—Surfacing with bituminous macadam under same specifications as above contract a section in Del Norte County between Elk Valley and Smith River, 3.8 miles in length. Contract price, \$12,186.

Better Alignment, Better Grades.

C. Miles, Sacramento.—Grading and surfacing with crusher run base, bituminous surface treated, a section of the Bishop-Mono Lake road in Mono County, between Mattley Ranch and Leevining. This section is 2.2 miles in length and the surfacing will be 20 feet wide. This project includes improvement in the present road by a revision and betterment in alignment and grades. Contract price, \$54,567.

Increasing Traffic Capacity.

Monarch & Breen, Portland, Oregon.—Grading section 38 feet wide in San Diego County, between Miller Creek Tecate Divide, 3.9 miles in length. This is a part of the San Diego-El Centro road. The new alignment and grades on this section will make an increased traffic capacity possible. Contract price, \$73,897.20.

Two Grade Crossings Eliminated.

Otto Parlier, Tulare.—Undergrade crossing beneath the Southern Pacific tracks at Califa in Madera County. This subway will eliminate the present grade crossing at Berenda, 4 miles south of Califa, and will also eliminate the grade crossing at Califa on the Pacheco Pass route by combining the two crossings at this location. The subway will consist of concrete abutments with wing walls and grading and paving approximately 280 feet of roadway with Portland cement concrete 34 feet wide. The superstructure is to be placed by the Southern Pacific Company. Contract price, \$31,463.50.

NONRESIDENT CARS

Since January 1, 1929, the Department of Public Works has checked 76,451 nonresident cars through border checking stations located at Yuma, Daggett, Dunsmuir, Clam Beach, Donner and Meyers.

Salinity Studies Along Delta Are Now In Progress

The investigation of the behavior of salinity in the delta of Sacramento and San Joaquin rivers in relation to the inflow of fresh water into the delta and to the tidal action, has been carried forward very actively both in field and office. Salinity samples are being taken at 70 regular stations throughout the bay and delta regions every four days. During and following the period of minor flood conditions in Sacramento and San Joaquin rivers, daily observations were made of the salinity conditions at 25 representative stations. Sixteen tidal cycle surveys over 24-hour periods were made at eight stations to ascertain the relation of salinity both as to stage of tide and to depth of water. In order to determine the distribution of salinity at the mouths of the Sacramento and San Joaquin rivers, eight surveys have been made at each of the two stations established near Antioch above the mouth of the San Joaquin River and near Collinsville above the mouth of the Sacramento River. Samples were taken simultaneously at each station on each survey at points about 200 feet apart and for several depths. About 1000 samples in total were obtained and analyzed in these sixteen surveys. Continuous records are being obtained at 17 stations extending from the Presidio on San Francisco Bay to Sacramento on the Sacramento River and to Stockton on the San Joaquin River. The United States Coast and Geodetic Survey, War Department, and the California Debris Commission have cooperated splendidly with this office in furnishing data and supplying equipment for this work.

Relative salinity content of water diverted for irrigation and water pumped out as drainage from representative islands is being determined. More than 3000 samples of water have been taken to date in this investigation. These have all been analyzed to determine the chlorine content, by the State Highway Laboratory under the direction of Mr. T. E. Stanton, Materials and Research Engineer.

The engineering advisory committee, Messrs. H. L. Haehl, Thos. H. Means and George A. Atherton, met in Sacramento on July 26, reviewed the work accomplished by this office, and advised as to the continuance of the work.

A court has decided that a cow in the road always has the right of way. This indicates that the courts are just learning what the cows have always known.—*San Diego Union.*

THE CALIFORNIA HIGHWAY PATROL

Continued from page 5.)

we have secured a man of the highest caliber. Mr. Biscailuz did not seek the job, and, indeed, it was only after considerable persuasion that we were able to convince him he should make a personal sacrifice to serve his state and country as head of the California Patrol.

The appointment of Mr. Biscailuz met with universal approval. I have received scores of letters and telegrams containing congratulatory messages.

The new superintendent is going about the job in a businesslike manner. His first step has been to undertake a survey of the various squads, operating as independent units up to now, with a view to correlating and standardizing their work.

This will require some weeks. Nothing will be done hastily and without due deliberation.

ORGANIZING DISTRICTS

Meanwhile other plans are under way for the organization of traffic districts in accordance with the new act and the creation of night patrols. I consider the latter most important, inasmuch as a large percentage of our fatal accidents occur at night.

We believe the officers will like their new superintendent, Mr. Biscailuz, and we believe they are going to be proud to be members of the new California Highway Patrol. We want to popularize the patrol, to give it prestige. That can be accomplished only when every officer sets himself in tune with the general scheme and comes to a realization of the dignity of his job.

Biscailuz has announced that he will rate the efficiency of his officers not on the number of arrests on their respective beats, but on the number of accidents. I am heartily in sympathy with the idea he is trying to express there, as, I am sure, is B. B. Meek, director of the Department of Public Works. Both Mr. Meek and myself feel that the traffic officer's most important work is to reduce accidents.

ASKS COOPERATION

We have a great deal to do in perfecting this organization and expect to be pretty busy for several months. The new patrol is our responsibility. We asked for it and the legislature gave it to us. Its success or failure will now depend upon our administration of it.

Let me say here that I am glad the Division of Motor Vehicles has been made a part of the Department of Public Works, for I be-

FLOOD CONTROL FOR SACRAMENTO AND SAN JOAQUIN RIVERS

At the meeting of the Reclamation Board held on July 24, the Board approved the report of the special committee, consisting of A. M. Barton, Stephen W. Downey and R. L. Jones, concerning the construction program for the year ending June 30, 1930, and adopted the program therein recommended. The program for construction is as follows:

	U. S.	State	Local
West Intercepting Canal—			
Project No. 6-R. W.-----	-----	\$5,000	-----
Construction -----	\$12,500	12,500	-----
Clearing Butte Slough, Sutter and Tisdale By- passes, Project No. 6-----	-----	65,000	-----
Sycamore Slough Gates-----	8,000	4,000	\$4,000
Feather River levee, Star Bend -----	33,640	16,820	16,820
Feather River levee, Lake of the Woods-----	34,244	17,122	17,122
Removing levees, Feather River -----	-----	15,000	-----
Clearing Feather River—			
Eliza Bend-----	-----	2,500	-----
Star Bend-----	-----	1,500	-----
Lake of the Woods-----	-----	5,000	-----
Above Marysville-----	-----	18,558	-----
Feather River levee, Hamilton Bend-----	6,000	3,000	3,000
Clearing American and Sacramento rivers-----	-----	7,500	-----
Control works at Nelson Bend -----	14,000	14,000	14,000
Totals -----	\$108,384	\$175,000	\$54,942

The foregoing program and report were approved by the California Debris Commission, by the construction committee of the Flood Control Association of Sacramento and San Joaquin Rivers System, and by the Feather River Associated Levee Districts. The levee construction involved is all on the Feather River, and the program is satisfactory to all interests concerned. In fact, no objections whatever were made to the program as finally presented.

At the same meeting, the Reclamation Board, by resolution, requested the Department of Public Works to prepare the necessary plans and estimates for the various units of work involved.

Preliminary surveys were made for new project levee construction on the Feather River at Star Bend and Lake of the Woods. Each of these lines was approximately one mile in length, and they were made for the purpose of preparing a fairly accurate preliminary estimate of the cost of these units.

IDAHO leads the states in mileage of national forest roads and trails, with 1776 miles of roads and 8848 miles of trails.

lieve the change will do much toward bringing the builders of our state highways closer to those charged with the patrolling of these highways. It is my hope that the closest of cooperation may prevail, for we have many problems in common.

Lastly and most important of all, we must have the assistance, cooperation and confidence of the motorist to make the California Highway Patrol a success. We invite criticism from the public and suggestions that will enable us to handle our work better.

Program Adopted For Water Study in San Joaquin Valley

A PROGRAM for the investigation of water conditions in the San Joaquin Valley has been outlined by the Division of Water Resources. The investigation comprehends an inventory of the local water supplies, an inventory of the irrigable lands classified as to their ability to pay for a water supply, an estimate of the immediate and ultimate water requirements of these lands for full development and of the amount of water required to be imported to meet these requirements, and an estimate of the physical works necessary for making available an adequate and dependable water supply for this area. In connection with this investigation the following has been accomplished to date:

1. All of the irrigable lands in the valley south of Fresno River have been classified, about 5,000,000 acres. This work is being continued and extended toward Stockton.

2. A crop survey of the entire area is underway. The major part of Tulare County and a part of Kings County have already been covered. This survey will also cover entire valley.

3. In cooperation with the irrigation districts, all of those wells on which observations have been obtained for the past several years, and on which actual elevations are not available are being referred to the datum of the United States Geological Survey. Provision has been made for obtaining a set of observation on all of the wells, totaling between 2000 and 3000 on or about October 1.

Office studies have been carried forward to determine the economic location of exchange canals from the San Joaquin River to the Kings River and Kings River to Kern River. These studies together with a field trip disclosed that it is physically feasible to deliver Kings River water into Kern County.

SACRAMENTO VALLEY INVESTIGATION

A program similar to that for the San Joaquin Valley has also been outlined. The work to be included in this investigation will be parallel to that for the San Joaquin Valley except that it also comprehends a plan for making available an adequate and dependable water supply for the industrial area on Suisun Bay and for the control of salinity in the delta of the Sacramento and San Joaquin rivers.

SOUTHERN CALIFORNIA INVESTIGATION

In connection with the investigation on the Mojave River, six tentative points of measurement of stream flow have been selected to determine the water supply in that basin. Arrangements have been made for the continuation of stream gaging in the Santa Ana River watershed and for the continuation of the study of the flood problems of this area in conjunction with the United States Department of Agriculture.

Progress of Work At Various State Institutions Told

THE Division of Architecture announces that plans have been approved and bids advertised for two buildings at the Mendocino Hospital with a total capacity for 240 patients. Working drawings are being completed and will be ready for advertising for bids about September 20th for the reconstruction of what is known as "Ward 7" at Mendocino. The portion of this new group provided for in the 1929 budget will add 120 patients to the capacity of the institution.

At Patton a contract has been awarded and work in the field is underway under a 1929 appropriation for a ward building which is to house 50 tubercular male patients.

At Agnew, the Director of Institutions has approved the use of plans now available for patients' ward buildings and other buildings at the farm provided for in the 1929 budget, with a view to getting this construction under way promptly.

A similar course of procedure is to be given consideration in connection with the new institution for insane in the south. Action by the Division in this instance is awaiting selection of a site.

Bids for a ward building for patients at Sonoma State Home for the feeble-minded, provided for in the 1929 budget will be opened on October 1st. This building will accommodate 80 patients but is intended to replace an existing building which has been condemned. Preliminary work on the reconstruction of the north wing of the main building at Sonoma recently damaged by fire and which housed a large number of patients, is now under way in the field.

It will probably be agreed in connection with a ward building for 80 patients at Pacific Colony, to use plans now available.

At Folsom Prison a change in field organization is being made which will speed construction work on the cell block, hospital and administration unit which has been under way for some time.

NATIONAL PARK TRAVEL

According to the National Park Service, United States Department of the Interior, automobile travel to the national parks has made tremendous strides in the last six years. In 1923 a total of 191,287 private automobiles entered 12 of the western parks; in 1928 the number was 439,049 cars, 129 per cent more than in 1923; and the 1928 figure for one of the parks was 420 per cent greater than the 1923 figure.

Rastus: "I tells you, Sambo, I done found out de difference between men and de women at las."

Sambo: "What—what is it?"

Rastus: "Wall, a man'll gib two dollars for a one dollar thing dat he wants, an' a woman'll gib one dollar fer a two dollar thing she don't want!"

In connection with the snow survey work, authorized by the last legislature, considerable progress has already been made in establishing contacts with the users of water from the various streams which will lend cooperation in laying out courses, constructing stations and furnishing observers. Equipment is now being collected and arrangement and plans being made to carry on this work.

THE CIVIL SERVICE CANDIDATE AS THE EXAMINER SEES HIM

(Continued from page 10.)

reinforcement and its importance in certain locations.

Lack of experience in executive control is often shown by candidates who apply for a job which requires the running of a field party or the controlling of inspectors, in which work they have never had any experience. The contacts which must be maintained with contractors and the public in a harmonious manner are most important, and are considered by examiners in judging the fitness of a candidate to have charge of work.

Lack of study of the trend of highway construction is one of the surest means to obtain a poor rating when trying for a position of advanced grade. The examiners themselves are usually eager to obtain all the information possible along these lines, and to have candidates come before them who have taken no interest in the study of the progress of highway design and construction immediately prejudices them against the candidate. Employees who do not study, who take no magazines relating to highway work, belong to no engineering society, have not read the manuals issued by the departments for their benefit, have no books on highway engineering, materials or inspection, and who, in general, feel that they just have a job, do not arouse the interest of the examiner.

Lack of experience in surveying is often a cause of a candidate being unsuccessful in his examination, since surveying and mapping are the essential foundations of all highway work. Experience in location surveys and construction surveys are essential to a well rounded career in highway engineering, and employees who do not make a study of these subjects will find great difficulty in progressing.

Inability to explain to the examiner the information which the candidate really has is a serious obstacle to his passing the examination. As a rule, the examiner will do all in his power to put the candidate at his ease, as their purpose is not to find an excuse for rejecting him but more to bring out the information which will indicate whether or not he will be of value to the state in the position which he seeks. If candidates will bear in mind that the examiner has probably had to talk to a great many candidates of various kinds before he came along, and may be more or less disgusted with their inability to express themselves, he will have a better understanding of the means of approach which he should use in presenting his claims for acceptance in a grade.

Attempts to impress the examiners that the candidates are better informed or more experienced than they really are is usually not attendant to success. The examiners have had a great deal of experience in meeting people, and can readily detect the bluffer. Applicants should bear in mind that the examiners are not unfriendly, but they have had to interview a great number of applicants of various kinds. They are frequently behind schedule through giving applicants who were poorly prepared or unable to express themselves more than their allotted time, to afford them an opportunity to demonstrate the necessary qualifications and may be more or less at the point of giving up in despair in their efforts to develop

necessary information from people who at first contact do not seem to have it.

Many candidates suffer from the habit of securing glowing tributes to themselves from former employers. They thus attempt to build up a paper record for themselves which will indicate to the examiner that the state would suffer a great loss if they are not employed or granted the increase in rating for which they apply. While it is true that a candidate should be rated as fully and justly as possible, it is also true that a candidate who has been overrated in the opinion of his employer naturally is handicapped when appearing before the Civil Service examiner. Some department heads lack the firmness or judgment to give a sufficiently strict and honest evaluation of the characteristics of their employees, and this tendency soon shows up when a number of recommendations are received, each bearing the imprint of good fellowship rather than a correct and just analysis of the candidate's abilities.

It is my belief that the examiners are usually just in their analysis of a candidate's capabilities, and so far as my experience goes, they have been willing to discuss matters with a candidate who has been unsuccessful in order to point out to him the causes which prohibited them from giving him a better grade than he received. Many candidates assume at once that they have been unfairly dealt with, whereas, if they would analyze, for themselves, some of the causes which lead to their failure as outlined above, they would no doubt be in a position to correct these difficulties in future examinations.

"HOW TO CASH IN ON THAT ACCIDENT POLICY"

Always drive fast out of alleys.

Always race with locomotives to crossing. Engineers like it; it breaks the monotony of their jobs.

Always pass the car ahead on curves or turns. Don't use your horn, it may unnerve the other fellow and cause him to turn out too far.

Demand half the road—the middle half. Insist on your rights.

Always speed; it shows people you are a man of pep.

Never stop, look or listen at railroad crossings. It consumes time.

Drive confidently, just as though there were not eighteen million other cars in service.

Always lock your brakes when skidding. It makes the job more artistic.

Always speed up to cars ahead of you; also speed up to stop intersections; then slap on the brakes; it helps the tire manufacturers increase sales and gives you additional time in the repair shop for brake linings.

If the mechanism of your motor when running does not sound good, don't stop to investigate—keep on going just to see what happens.

Always pass cars on hills. It shows you have more power; and you can turn out if you meet a car at the top.

Never look around when you back up. There is never anything behind you.—Contributed.

SASKATCHEWAN—A 1000-mile continuous gravel road directly across the province, which will be completed this year at a cost of more than \$1,000,000, is a feature of a \$20,000,000 four-year road program just begun. About 2000 miles is to be added to the improved provincial system.

Progress Reports From the Counties

ALAMEDA COUNTY

The contract for widening of the section of the Oakland-San Jose road between Hayward and Niles has been let to Hanrahan Company of San Francisco. The work is just starting and consists of regrading the roadbed and widening the pavement from 18 feet to 29 feet by constructing an 11-foot Portland cement concrete strip on the easterly side of the existing pavement and surfacing the existing pavement with asphaltic concrete.

This work is similar to that done on the section between Warm Springs and Milpitas and will be a big step in the reconstruction of this road between the East Bay cities and the Santa Clara Valley and the coast route to Los Angeles.

CONTRA COSTA COUNTY

Traffic using the Martinez road will appreciate the new work through Pinole and Hercules as traffic is now carried over much of this section on finished pavement. The Portland cement concrete work is progressing rapidly. When this section is completed, the road from Oakland to the Carquinez Bridge will be a widened boulevard that will serve for the present the extremely heavy and rapidly increasing traffic over this section.

DEL NORTE COUNTY

The Holdener Construction Company, who have the contract for oil surfacing 35 miles of the Redwood Highway from the Oregon line to the new Hiouchi Bridge over Smith River, expect to have the work entirely completed within another month.

The Holdener Construction Company also have the contract for producing and stockpiling approximately 5700 cubic yards of crushed rock for a light bituminous surface over the 22 miles of the Roosevelt Highway in Del Norte County, between Crescent City and the Oregon line. It is expected that sufficient rock will be produced in order that state forces may begin placing of the surfacing by the first of September.

The Webber Construction Company have just completed the placing of additional crushed rock surfacing over 4 miles of highway between a point 5 miles east of Crescent City and the new Hiouchi Bridge over Smith River, on the Redwood Highway. They have also stockpiled sufficient crushed rock for letting to contract the placing of a 2-inch by 20-foot bituminous macadam surface over the entire 4 miles.

Bids were opened for the construction of the 2-inch by 20-foot bituminous macadam surfacing on August 14, and J. C. Compton was the low bidder on the work.

J. E. Johnston, who has the contract for grading and surfacing the Redwood Highway between Klamath River and Wilson Creek, has practically completed all the grading and surfacing work and the road is open to public travel throughout. He is now completing the necessary protection work along the ocean shore near the northerly end of his contract. It is expected that the contractor will have the job complete by the end of September.

Mr. J. E. Johnston also has the contract for grading and surfacing between the southerly Del Norte County line and the head of Richardson Creek, a point 2 miles south of Klamath River. The grading and surfacing have been sufficiently completed so that traffic has been carried over the work during the past winter and it is expected that the contractor will complete the finishing work within another month and additional drainage work by the middle of September.

By the end of the summer season it is expected that all the Redwood Highway and Roosevelt Highway in Del Norte County, with the exception of approximately 7 miles of the J. E. Johnston contracts, will have received a light bituminous surface or a higher type oil surface, and will be in excellent condition to carry over the winter.

FRESNO COUNTY

Convict Camp Number 19, near Hume on the Kings River Canyon Route, is now in full operation, there being about 120 convicts on the work and two power shovels employed. Activities at present are confined to the 5 miles of road between north line of General Grant Park and the convict camp.

Contractor Tieslau has started operations on his contract, which provides for an 18-foot oil-treated gravel surfacing between Coalinga and Parkfield Junction.

HUMBOLDT COUNTY

The Webber Construction Company has the contract for producing and stockpiling bituminous macadam rock along the Redwood Highway for a 20-foot by 2-inch bituminous macadam between a point 1 mile south of Orick and the northerly Humboldt County line. The rock as yet produced is not sufficient to permit the starting of the placing of the macadam surfacing immediately, but it is expected that the contract for the placing of the macadam surfacing will be completed in the late spring of next year.

The Engelhart Paving and Construction Company have a contract for placing additional surfacing and stockpiling rock for bituminous macadam pavement on approximately 3.3 miles of the Redwood Highway between Big Lagoon and Orick. The work is approximately one-third complete.

Kern & Kibbe have the contract for placing additional crushed rock surfacing over 4.3 miles of the Redwood Highway, from Trinidad southerly to Little River, and for stockpiling rock for bituminous macadam pavement over the same distance. The surfacing was completed about August 20th and the stockpiling of the macadam rock is under way.

W. C. Elsemore has completed approximately one-third of his contract of producing crushed rock for bituminous macadam pavement between Mill Creek and Little River, a distance of about 6.4 miles.

Bids were opened on August 14th for placing the bituminous macadam over the entire stretch between Mill Creek and Trinidad, and Heafy-Moore Co. of Oakland were the low bidders.

The reconstruction of the highway between Mad River and Mill Creek, 0.9 mile, by Ellison & Smith, contractors, is about 75 per cent complete and it is expected that traffic will be carried over the new work before the winter rains set in.

Contractors Kennedy & Bayles have made splendid progress on their contract for grading and surfacing the Redwood Highway between Arcata and Mad River and it is expected that they will complete their contract by the last of September.

The Butte Construction Company, who have the contract for the construction of the new bridge over Mad River, have made good progress and it is expected that the next season's tourist travel will be carried over the new bridge.

The construction of the overhead crossing of the highway, over the Northwestern Pacific Railroad and the Arcata and Mad River Railroad, approximately 1 mile north of Arcata, is under way by the Mercer-Fraser Company of Eureka.

The completion of the last four named contracts is expected in time to permit traffic over the entire distance between Arcata and Mill Creek by early next spring.

The grading of the new highway between Loleta and a point approximately $7\frac{1}{2}$ miles south of Eureka, a distance of 3.7 miles, is under contract to E. C. Coats of Sacramento. The grading work was approximately half complete on the last of August.

INYO COUNTY

From the southerly boundary to Little Lake, a distance of approximately 9.8 miles, Fred W. Nighbert has recently entered into a contract to grade and place an oil-treated surface; thence to Olancha, a distance of approximately 25.5 miles, the plans have been prepared for the grading and the placing of oil-treated surface which work will be advertised soon. In the meantime a dust palliative has been applied under maintenance appropriations, and the work executed under the supervision of A. C. George, Foreman.

From Olancha to the northerly boundary, an excellent oil-treated surface is in place with the exception that the portion from Cottonwood Creek to Diaz Lake, a distance of approximately 10.3 miles, G. W. Ellis has a contract for the grading and placing of an oil treated surface.

On the Westgard Pass lateral, Route 63, between Big Pine and Zurich, a dust palliative has been applied by maintenance funds under the direction of Dwight Wonacott.

KERN COUNTY

On Route 57, east of Bakersfield, between Bakersfield and Kern Canyon, Contractors Force-Currihan and McLeod, good progress has been made in laying base course and oil-treated surface. The contractor is now grading between the city limits and a point 3 miles easterly. A large cut 60 feet in depth, including about 80,000 yards, is being handled by hydraulic means, the material being washed into the fill without the use of any grading equipment. A drag line clears the channel of rock and boulders.

On the contract from Pentland Junction to San Emigdio Road, east of Maricopa, C. W. Hartman, Contractor, good progress is being made and it is expected to complete the work by the end of next month. A $4\frac{1}{2}$ -inch x 20-foot surface of local crushed rock is being used and several applications of fuel oil made for binding purposes.

From Mojave to the northerly boundary of Kern County, several constructive operations for improvement are under way.

That portion of the highway between Mojave and Cinco, a distance of approximately 17.2 miles is being graded to be followed by the placing of an oil-treated surface. This is being carried out by two contractors, namely: Bartlett & Mathews and the Southwest Paving Company.

Plans are being prepared for early grading and the placing of an oil treated surface from Cinco to 7 mile north of Ricardo, a distance of approximately 16 miles. Incidentally this section includes the scenic Red Rock Canyon, and when completed will provide a mecca for tourists who love the various moods of nature.

From this point on to the northerly boundary of the county, there are two other contracts under way for the same type of work, one by G. W. Ellis, and the other by Bartlett & Mathews-Black & Hagey, for a distance of approximately 24.1 miles.

Between Mojave and east via Route 58, under maintenance, we have just completed the placing of a dust palliative for a distance of approximately 30.8 miles. This work was carried on under the direction of Ed Monroe, Foreman.

An armor coat is to be placed on 4 miles of pavement west of Wasco, on the pavement from Olddale Junction to Beardsley Canal north of Bakersfield, Route 4 and on approximately 6 miles of Route 4 at certain locations south of Bakersfield.

Work is also in progress filling deep borrow pits between the south end of the Kern River Bridge north of Bakersfield and the Kern County Fairgrounds.

KINGS COUNTY

A day labor allotment of approximately \$13,000 has been approved for widening the roadbed and improving

drainage between Hanford and a point 8 miles east of Route 10. Work will be under way within a short time.

LOS ANGELES COUNTY

A line change immediately north of the Newhall Tunnel has been surveyed and plans forwarded to the central office. This change eliminates some very bad curves and it is expected construction will be under way this fall.

Work on paving crescent-shaped areas on the Ridge Route is being done by Gibbons & Reed, Contractors. These areas were left unpaved when alignment on this route was straightened by the state day labor forces. Emulsified asphalt is being used in this work.

Work of grading the Newhall Alternate Line between Tunnel Station and Santa Clara River is being done very rapidly. Le Tourneau and Lindberg are the contractors on this work. It consists of grading a 46-foot roadbed 8.6 miles long and eliminates from this route the Newhall Tunnel and several dangerous curves in the vicinity of Newhall and Saugus. It is expected this work will be completed about December 1st.

A contract on the Foothill Boulevard between Glendora and Claremont is rapidly nearing completion. This consists of 5.5 miles of asphaltic concrete pavement, 30 feet by 6 inches. The Griffith Company is the contractor.

The first contract on the La Canada-Mt. Wilson Highway for grading 2.6 miles of 40-foot roadbed was awarded to H. W. Rohl Company on August 14th. Grading work is in progress.

MADERA COUNTY

Work is now under way on the contract between Berenda Crossing and Califa. This contract provides for a 36-foot roadway and a 20-foot x 9-foot Portland cement concrete pavement. This will be on new alignment west of the Southern Pacific Railroad, eliminating the present grade crossing at Berenda, continues north through Califa and thence crosses the Southern Pacific tracks and present highway to the east and swings back to a connection with present road about 7/10 mile north of Califa. The contract includes all but the subway proper, bids for which were opened on July 31st. The completion of this project will eliminate two grade crossings, the one at Berenda and the one on Route 32 at Califa.

MARIN COUNTY

With the completion of the road from San Quentin to San Rafael, the 4.9 miles north of San Rafael, and the section in Sonoma County from Santa Rosa to Willow Brook, the Redwood Highway affords a clear highway to Cloverdale for those traveling via San Quentin, but the section of old road from San Rafael to Sausalito, especially over the Corte Madera Grade and through the many small towns still handicaps the tourist traveling via Sausalito. The remaining sections to complete the road from San Rafael to Petaluma are to be advertised for contract very shortly. A new bridge and extensive channel changes are under construction on new alignment at Novato Creek.

Granfield, Farrar & Carlin's contract from San Rafael to Alto, also the connection from Alto to the old road, will materially help to ameliorate this condition; the grading is progressing rapidly and the surfacing is to be advertised in a short time.

In the meantime the California Highway Commission is improving a portion of the old route, resurfacing 0.56 miles of pavement in the town of San Anselmo with asphaltic concrete. The contract was let to A. J. Raisch & Co. of San Francisco.

MARIPOSA COUNTY

The Basich contract, covering $6\frac{1}{4}$ miles of grading and rock surfacing on the Yosemite Lateral, was completed on July 30th. Oil-treating of the gravel surface

(Continued on page 22.)

How California is Developing an Adeq



By W. H. ROCKINGHAM, J

ONE OF THE activities of the Division of Architecture of the State Department of Public Works during the past three years, and a most interesting one from the standpoint of plan and the various branches of engineering involved, is the development of the National Guard Training Camp at San Luis Obispo, California.

Prior to the year 1928, the National Guard had been using for encampment purposes, a site at Del Monte.

This site, from the standpoint of delightful location and hospitality of the residents of the vicinity, was very satisfactory, but due to the fact that during the five years just preceding 1927 the National Guard had very rapidly increased in numbers from 3200 men to approximately 5600 men, this site had become too limited in area

training corps, had prevented the National Guard from holding its training periods at times most convenient to units and men. The National Guard, therefore, desired a permanent training camp which would be suitable in area and topography to accommodate it in its full strength and allow for proper training in all its various branches. It was further desired that such a camp should be so geographically located as to best serve all parts of the state and that climatic conditions should be the most desirable.

THE NEW SITE

With the purpose in view of selecting a suitable site, Brigadier General R. E. Mittelstaedt, The Adjutant General of the State of California, together with his officers of the National Guard and officers of the United States War Department, inspected various possible sites throughout the state and finally decided upon one near San Luis Obispo. All points being considered, the San Luis Obispo site was thought to be the most favorable for the activities of the National Guard encampment. Through the cooperation of prominent citizens of San Luis Obispo, it was made possible for the National Guard to enter into a 25-year lease of the site with an option to purchase. Such a lease was entered into in 1927 and comprised approximately 2000 acres of land. Upon this original lease the camp proper was located. Since 1927, however, additional adjacent land has been acquired



W. H. ROCKINGHAM, JR.

to properly accommodate them in training camp activities; furthermore, the use of this site as a training camp for the reserve officers training corps and for the citizens military

Encampment for the National Guard



r, Division of Architecture

and with mountainous government land which also adjoins to the north, the camp has area sufficient to give wide scope for field training in maneuvering and combat tactics.

The site is situated upon the highly improved state highway, between San Luis Obispo and Morro Bay, approximately four and one-half miles from San Luis Obispo and eight miles from the ocean at Morro Bay. The state highway crosses the site near its southern boundary.

A GENERAL VIEW

The camp proper is located in the southern portion of the site, entrance to which is made from the highway. Immediately upon entering the camp from the highway, a comparatively level valley is entered, which is approximately 700 feet wide and 2500 feet long. This level area is used as a parade ground and also for an aeroplane landing field. On each side of this valley the terrain rises; on the east side, resulting in a plateau upon which the regimental camps are established; on the west side, continuously rising into hills of considerable height. To the north the terrain rises with hills and ravines and at the northern boundary of the original lease, it rises precipitously into the mountains. The camp proper is at an elevation of approximately 300 feet above sea level.

Within a half mile of the camp, the Southern Pacific Railroad Company has siding facilities, and this, together with the improved

highways connecting with San Luis Obispo, and the coast, makes for great convenience in the handling of supplies and equipment and also in transportation of men during encampment.

PLANNING THE CAMP

In the spring of 1927, the Division of Architecture was called upon to plan a military camp on the above site. Although the construction proposed immediately was only a small part of the final plans, it was necessary to lay plans for an ultimate camp which would accommodate upward of 5000 men, it being known that in the succeeding years the camp would enlarge to reach such an ultimate capacity. The site as acquired by the National Guard existed merely as a cattle range; therefore, the first engineering necessity was a survey. The survey was made by the division's civil engineering parties which resulted in a topographical map covering an area of approximately 350 acres and showing thereon the topography in 1-foot contours. Upon this map, with the cooperation of Adjutant General Mittelstaedt, a camp with a capacity of five regiments, together with necessary warehouse facilities, recreational facilities, corrals, rifle ranges, etc., was laid out. As above mentioned, four regimental areas were established on the plateau lying to the east of the central level section which is the parade ground and aeroplane landing field. One regimental area lies on slightly

higher ground than the parade ground and to the north thereof. Centrally located between the regimental areas and in a small comparatively level space, branching easterly from the parade ground, are located the headquarters building and recreational facilities. Also in this area are located a large truck shed and regimental warehouse. To the west and in a position commanding a view of the parade ground and of regimental areas, is located the caretakers' cottage and also the officers club building. Between the caretakers' cottage and the officers' club building, a prominence exists whereupon is located the flag pole. This location makes the flag visible from all parts of the encampment.

THE FIRST UNIT

In the latter part of 1927, construction was started on the first unit which was known as Regimental Area No. 2, together with the necessary warehouse and corrals. At this time also, the installation of the systems for water supply, sewage disposal system, garbage disposal and horse corrals, was started. This initial construction was completed and the camp occupied in July of 1928 with facilities for accommodating one regiment. During the year of 1928, a second regimental area was developed known as Regimental Area No. 1 adjacent to the original construction. A swimming pool was also installed and Post Exchange, Officers' Club House, Headquarters Building, caretakers' cottage and additional warehouse, which resulted in the camp being open in the summer of this year with a capacity of two regiments. Plans are now going forward for the construction, in part, of still another regiment; therefore, it can be seen that this camp is very rapidly developing.

FEDERAL AND PRIVATE FUNDS

The camp is being built by United States War Department appropriations of federal funds. These funds cover all construction except such buildings as the Post Exchange, swimming pool, etc., which have been constructed with funds derived by subscription from the National Guard personnel.

DETAIL OF CAMP

In order to convey an idea as to the character and scope of this camp, it may be well to describe in general the various units constructed.

A typical regimental area covers an approximate area of ground 700 feet square. It consists of sixteen kitchen and mess buildings, one for officers and fifteen for enlisted men; four lavatory buildings, one for officers and

three for enlisted men; two hundred and seventy tents, sixty for officers and two hundred and ten for enlisted men; and one infirmary. Aside from the above area, each regiment requires its regimental warehouse.

The kitchen and mess buildings as well as lavatory buildings, are of permanent frame construction with asphalt felt shingle roofing and concrete floors. These buildings are equipped with the most modern sanitary fixtures and piping. All buildings are completely wired for electricity with modern illumination. The kitchen in each case is equipped with a coal or wood burning range with a water back and hot water storage tank. The lavatory buildings are equipped with showers, wash basins, and other sanitary fixtures and hot water is developed in these buildings by means of a wood or coal fired boiler with a large size hot water storage tank, assuring every facility for the comfort of the men. The tents are of canvas or duck, and are erected each year upon wooden platforms built for the purpose. At the end of each encampment period, these tents and platforms are taken down and stored for use in the ensuing year.

Each regiment is laid out with the enlisted men's kitchen and mess buildings in a row facing an area 100 feet wide. On the opposite side of this area is located the officers' line of tents with the officers' kitchen and mess building and lavatory building at one end thereof. To the rear of the enlisted men's kitchen and mess buildings, are located the lines of enlisted men's tents, each line of tents representing accommodations for one company. These lines of tents face on the company streets which give access to the company's kitchen and mess building above mentioned. Lavatories are located on the opposite side of the enlisted men's tent areas from the kitchen and mess buildings. Each regimental area has its system of electrical distribution controlled from a switchboard located at the corner of the regimental area. All tents are provided with electric outlets. All regimental areas and streets are lighted by means of suitable fixtures installed upon the permanent poles carrying the distribution circuits the approximate connected electrical load of each regiment being 50 kilowatts.

The post exchange and the swimming pool have already been constructed as a part of the recreational facilities. These features are centrally located, the post exchange catering to the requirements of the men in the matter of selling confections, tobacco, etc. The swimming pool is a concrete structure 50 feet wide by 100 feet long, and is fully equipped with chlorinating, recirculating and filtering equipment.

WATER SUPPLY, SEWAGE, GARBAGE

The considerations relative to water supply, sewage disposal and garbage disposal, were quite extensive and interesting. The water supply is obtained from a live stream known as Chorro Creek, running through the camp site. The water from this stream is clear and palatable and from investigations the amount to be obtained is satisfactory for caring for the camp at its ultimate capacity. The water supply is obtained by pumping from this stream by means of two centrifugal pumps, 300 gallons and 500 gallons per

minute, respectively. These pumps deliver water into a reservoir. The reservoir is formed by a cut and fill and is lined on the inner side with gunite on mesh reinforcement. Its capacity is approximately two and one-half million gallons. The water is led from the reservoir to the encampment and distributed to all units of the camp by means of welded steel pipe ranging from 10 inches in diameter at the reservoir to 4 inches in diameter at the extreme points of the system. Local connections are made from this water distribution system for the various services, with pipes of varying smaller sizes.

Aside from piping within the buildings, there is in the neighborhood of six miles of piping installed in the distribution system. Although the water from Chorro Creek is cool and clear during the summer months as its source is in the high mountains lying to the north of the camp, the water supply is safeguarded by the installation of chlorinating equipment, thus rendering an absolutely safe domestic supply for the camp.

Due to the character of the terrain on which the camp is constructed, the matter of sewage disposal was quite a problem. With the cooperation of Mr. Gillespie, Chief of the Bureau of Sanitary Engineering, of the State Department of Health, a system was planned which has worked out satisfactorily. The collecting system of sewers is composed of about four miles of vitrified sewer pipe 8 inches and 6 inches in diameter. This system delivers sewage to the Imhoff tank where it is clarified and the effluent collected in an adjacent sump. By means of an electrically driven pump, the effluent is forced through approximately 4700 feet of 6-inch diameter welded steel line to the storage reservoir of a neighboring farmer. The Imhoff tank is constructed of concrete and is approximately 50 feet long, 16 feet wide and 22 feet deep. Adjacent to the Imhoff tank is a sludge drying bed for handling the sludge for digestion in the Imhoff tank.

Garbage, which in a camp of this size accumulates in large quantities, is disposed of in an incinerator constructed for that purpose. The incinerator is located several thousand feet from the camp proper and is of masonry construction and fired by oil with a mechanical burner.

ROAD WORK

In the development of the plot plan of the camp, the Division of Architecture indicated the locations of necessary roads to give the most direct communication between the units of the camp. The actual work, however, of surveying and drawing up the specifications for these roads was handled by the Division of Highways of the State Department of Public Works through their Division Office at San Luis Obispo. The system of roads installed at the camp is such as to give the utmost ease and efficiency in movement between the various units of the camp.

To the north of the camp proper and located with the mountains as a background, there have been installed two rifle ranges, one of 200 yards and the other 300 yards range. The target pits for these ranges are of concrete construction. The target pits for both ranges are connected by a passage. There are 14 6-foot by 6-foot sliding targets on 12-foot spacing for each range. A permanent system of signal wiring has been installed between positions on the firing line and target pits. This wiring is installed by means of leaded conductors in underground conduit.

A REAL MILITARY ESTABLISHMENT

The electric service to the camp was installed by the Midland Counties Public Service Corporation.

This company installed their lines throughout the camp, following the principal streets and upon their poles suitable fixtures were installed to give very satisfactory general illumination of the streets. The power company's service lines carry 10,000 volts and transformers have been installed to reduce this voltage to 110 and 220 volts for use in the various units of the camp.

The description herein has merely touched on some of the major features of this camp. A vast amount of work has been done in preparing the ground for the various purposes such as the planting of the parade field and the grading and planting of grounds surrounding the various buildings, which makes the camp even at this stage of partial completion, a real military establishment, functioning properly in every respect and the object of favorable comment from persons of high standing in military life.

The Division of Architecture has been working on the development of this camp for three years, and during this period there has been a maximum of cooperation by the Adjutant General and members of his staff. It is anticipated that the future will bring continued additions to the camp until it reaches a capacity to accommodate the full force of the National Guard.

THE NEW DIVISION OF WATER RESOURCES

(Continued from page 2.)

The history of the development of this division is of interest. The Department of Engineering, headed by the State Engineer, was established in 1907 and at that time embraced practically all of the engineering activities of the state government, including highway construction and the San Francisco Harbor. At this time there was no active state supervision of irrigation districts nor was there state highway work of consequence. In 1910, the first highway bond issue was passed and the Highway Commission established, and later the San Francisco Harbor was put entirely under the direction of the harbor board. Irrigation district activities increased at a very rapid rate from 1913 on and became the principal work of the State Engineer for some years. In 1921 the Department of Public Works was created and the former Department of Engineering was made the Division of Engineering and Irrigation under the Department of Public Works and has remained in this status until the 1929 consolidation.

In 1914, the State Water Commission was created to have charge of the administration of water rights in California, the Commission consisting of three members. In 1919, the Commission was changed to consist of one executive member and two per diem members, and in 1921 this also came under the new Department of Public Works as the Division of Water Rights.

MINNESOTA—Every horse-drawn vehicle using public highways at night must now carry a red or yellow rear lamp or reflector.

PROGRESS REPORTS FROM THE COUNTIES

(Continued from page 17.)

is under way under day labor and will be completed about August 7th.

Oil mixing of surface between Mariposa and El Portal on the Yosemite Lateral is in progress and will be completed in about one month.

MENDOCINO COUNTY

The contract for grading several line changes and building three timber bridges on the road from McDonald to the Sea, was let to W. C. Colley of Berkeley. The work is well under way, piles having been driven for the timber bridges at Flynn Creek and at the North Fork of the Navarro River, and it is expected that the work will be completed before the winter rains start.

In order to continue the construction of this road to modern standards, the work has been programmed by stages, to do as much work each biennium as funds will allow, scattering the work so as to eliminate the worst stretches as soon as possible, with the hope that in the next few years the complete road can be regraded and surfaced.

State forces are widening and straightening the roadway between the sidehill viaduct about 4 miles north of Lane's Redwood Flat, and Red Mountain Creek. When this portion of narrow road along the steep bluffs of the South Fork of Eel River is completed, the last very narrow section of the Redwood Highway will have been eliminated. The road is being graded to a 24-foot standard roadway width and surfaced with 8 inches of crushed rock surfacing.

MONO COUNTY

At Hilton Creek, 1.57 miles grading by D. C. Follis, is nearing completion.

Between McGee Creek and Convict Creek, 3 miles grading, crushed rock base, oiled surface course, by Montfort & Armstrong. Work recently commenced.

At Leevining Creek, Route 23, Tioga Junction, 2.18 miles grading, oiled macadam surface. Contract recently awarded to C. Miles, who is establishing his camp.

There is also under way a day labor job, 3 miles, grading and surfacing of a portion of Route 23, in the vicinity of Walker River Canyon, near Coleville, nearing completion. This work is under the supervision of Paul Peak, Foreman.

A dust palliative extending from the summit of Sherwin Hill to Mono Lake, a distance of approximately 54.3 miles will do a great deal to make the travel pleasurable on this stretch, until a more permanent type of pavement can be placed. This work has been carried out by maintenance funds under the direction of Dwight Wonacott, Foreman.

Two log bridges on the Sonora Pass Road, have just been completed and are now open to traffic. The bridges were constructed under the direction of Frank L. Smith, Bridge Superintendent. These are the last of the eight structures eliminating the fording of crossings which have caused the traveling public great inconvenience in the past, on account of the high water caused by the melting snow in the early spring.

NAPA COUNTY

Bids for the construction of oil-treated crushed rock shoulders between Napa and Greenwood Corners were recently opened, the low bidder being Smith Bros. Co. of Eureka. Contract will probably be awarded immediately.

Bids were opened August 7th for widening the roadbed and constructing a bituminous macadam surface on the section from Greenwood Corner to Solano County line. This improvement will include a line change that will eliminate two existing right angle turns, will materially improve the grade, and will shorten the distance about $\frac{1}{4}$ mile.

THE SKYLINE BOULEVARD

Twohy Bros. & J. F. Shea's contract on the section from La Honda road to Saratoga Gap is complete except watering and rolling the surface and some extra work on slide control.

A contract has been let to Tieslau Bros. to furnish 4100 cubic yards of screenings in stockpiles, the state forces to place same and oil to obtain an armor coat, when the road can be opened to the public. This should be completed by about the middle of September.

ORANGE COUNTY

The contract for a line change 0.7 of a mile in length between Serra and San Juan Capistrano was awarded to Match Bros. on August 12th. This work consists of a 40-foot graded roadbed with Portland cement concrete pavement, 20 feet by 7 inches. Grading is in progress on this section.

A contract for a line change to connect up the overhead crossing of the A. T. & S. F. Railway at Irvine is in progress. This consists of grading 0.7 of a mile and paving with Portland cement concrete, 30 feet wide.

A contract for paving one-half width between Santa Ana and Anaheim was awarded on June 11th to Griffith Company. This section is 4.9 miles long. The paving work is being done in cooperation with Orange County, the state paying for a strip of pavement 28 feet by 7 inches and the county paying for a like amount.

SAN DIEGO COUNTY

Plans have been completed for rock borders on the coast route between the city limits of San Diego and Oceanside. Bids were opened on August 21st, the low bidder, being the R. E. Hazard Contracting Company of San Diego.

A contract for grading the Rose Canyon Road between Balboa Avenue and Torrey Pines Road was awarded on August 13th to the R. E. Hazard Contracting Company. This section is 5.4 miles long and is to be a 46-foot graded roadbed.

A contract for grading a 36-foot roadbed from Viejas Creek to Guatay Creek on the San Diego-El Centro Highway was recently completed by the Hauser Construction Company. This section is 7.2 miles long.

The construction of 3.9 miles of graded roadbed 36 feet wide has recently been completed by the Nevada Contracting Company, from Pine Valley to Guatay Creek on the San Diego-El Centro Highway.

The contract for grading a roadbed 36 feet wide and placing of Portland cement concrete pavement 20 feet by 7 inches is in progress between Pine Valley and Kitchen Creek on the San Diego-El Centro Highway. Basich Bros. are the contractors.

A contract for 4.5 miles of 38-foot graded roadbed between La Posta Creek and Miller Creek on the San Diego-El Centro Highway was awarded on May 27th to the Nevada Contracting Company. Grading is in progress on this section.

A contract for grading 3.9 miles of 36-foot roadbed from Kitchen Creek to La Posta and paving with 20 feet by 7 inches, Portland cement concrete, was awarded on June 25th to Basich Bros. Grading is now in progress. This section is on the San Diego-El Centro Highway.

SONOMA COUNTY

The 11.44 miles of second-story Portland cement concrete pavement 20 feet wide between Santa Rosa and Willow Brook is completed. It is an excellent job reflecting credit on all of those concerned and is receiving much praise from both local people and the traveling public.

The resurfacing of the Black Point Cutoff between Fairville and Vineburg Junction is progressing nicely, all grading and crusher run base being completed and much surface laid and oiled. Extension of culverts will be completed about the same time as the surfacing and traffic ought to have possession of the road in a few weeks.

TULARE COUNTY

Bids were opened Wednesday, July 31st, for a 12-mile improvement in Tulare County between Delano and Pixley. The low bidder was Valley Paving & Construction Company. The improvement consists of resurfacing with asphaltic concrete 20 feet in width, the present 15-foot base, which is in very poor condition and grading a roadbed 36 feet wide. All curves around railroad reservations will be increased in radius to conform with present standards.

VENTURA COUNTY

The last link of the new Roosevelt Highway connecting Santa Monica with Oxnard was completed by Jahn & Bressi Contractors on August 15th. This work was delayed by heavy slides at various places. This completed the pavement 20 feet wide by 7 inches thick of Portland cement concrete between these two cities.

CONTRACTS ACCEPTED

Contract for grading 7.2 miles between Viegas Creek and Guatay Creek in San Diego County on the San Diego-El Centro highway, approximate cost, \$279,000, Hauser Construction Company of Oakland, contractor; accepted July 30, 1929.

Contract for grading and paving with Portland cement concrete 3.3 miles between Pismo and Arroyo Grande in San Luis Obispo County; approximate cost, \$139,000, Cornwall Construction Company of Santa Barbara, contractor; acceptance date, July 30, 1929.

Contract for grading and surfacing with crushed gravel a section of the Yosemite Highway in Mariposa County has been accepted as completed. The section improved under this contract is 6.3 miles in length and extends from the westerly boundary of Mariposa County to Orange Hill. The cost of the work was approximately \$200,000, Basich Bros. Construction Company of Los Angeles, contractor; acceptance date, August 6, 1929.

Contract in Santa Barbara County covering grading and surfacing with asphaltic concrete between Stony Creek and Tecolote Creek, 3.4 miles, on Coast Route, at an approximate cost of \$122,900; Sam Hunter of Santa Barbara, contractor; acceptance date, August 9, 1929.

Contract for grading and surfacing with oil-treated crushed gravel or stone between Roseville and Rocklin, Placer County, 2.9 miles, approximate cost, \$55,100; J. E. Johnston of Stockton was the contractor; acceptance date, August 19, 1929.

Contract for grading and surfacing with screened gravel between Bieber and Adin, Lassen County, 12.5 miles; approximate cost, \$124,000; Coolidge and Scott were the contractors; acceptance date, August 19, 1929.

Contract covering grading and paving with Portland cement concrete about 11.6 miles between Hueheme Road and Little Sycamore Creek on Rt. 60 (Oxnard-Santa Monica Highway), in Ventura County, at an approximate cost of \$625,000; Jahn and Bressi Construction Company of Los Angeles, contractor; acceptance date August 25, 1929.

Contract covering surfacing with pit run gravel between Logandale and Willows, Glenn County, covering 5 miles and costing approximately \$33,600; E. C. Coats, Sacramento, contractor.

*Record of Bids and Awards***BID OPENINGS FROM
JULY 24, TO AUGUST 31**

DEL NORTE COUNTY—Between Elk Valley and Smith River, 3.8 miles to be surfaced with bituminous macadam. Dist. I, Rt. 1, Sec. C. J. E. Johnston, Stockton, \$16,780; Heafy-Moore Co., Oakland, \$19,212; Smith Bros. Co., Eureka, \$16,050; Holdener Const. Co., Sacramento, \$20,521. Contract awarded to J. C. Compton, McMinnville, Oregon, \$12,186.

EL DORADO COUNTY—Bridge across Tallac Creek about 8 miles north of Meyers. Dist. III, Rt. 38, Sec. A. R. B. McKenzie, Red Bluff, \$9,999. Contract awarded to Lord and Bishop, Oroville, \$8,848.50.

GLENN COUNTY—Between one-half mile west of Butte City and Chico Road, 3.5 miles to be graded and treated with fuel oil. Dist. III, Rt. 45, Secs. B & C. J. E. Johnston, Stockton, \$3,088; Albert G. Raisch, San Francisco, \$6,166. Contract awarded to Hemstreet & Bell, Marysville, \$5,652.50.

HUMBOLDT COUNTY—Between one mile south of Orick and northerly county boundary, 14.3 miles to be surfaced with bituminous macadam. Dist. I, Rt. 1, Sec. K. J. E. Johnston, Stockton, \$67,105; Smith Bros. Co., Eureka, \$63,058. Contract awarded to Heafy-Moore, Oakland, \$62,445.

HUMBOLDT COUNTY—Between Mill Creek and Trinidad, 10.6 miles to be surfaced with bituminous macadam. Dist. I, Rt. 1, Sec. I. Smith Bros. Co., Eureka, \$45,173; J. E. Johnston, Stockton, \$46,632; Mercer-Fraser Co., Eureka, \$53,667. Contract awarded to Heafy-Moore Co., Oakland, \$38,564.50.

INYO COUNTY—Between southern boundary and Little Lake, 9.8 miles to be graded and surfaced with oil-treated crushed gravel or stone. Dist. IX, Rt. 23, Sec. G. A. D. Drumm, Jr., Fallon, Nevada, \$124,492; G. W. Ellis, Los Angeles, \$142,805; Southwest Paving Co., Los Angeles, \$135,386. Contract awarded to Fred W. Nighbert, Bakersfield, \$111,920.10.

LOS ANGELES COUNTY—Between La Canada and 2 1/2 miles northerly, 2.6 miles to be graded. Dist. VII, Rt. 61, Sec. A. Dimmitt & Taylor, Los Angeles, \$310,322; J. P. Holland, San Francisco, \$274,031; J. G. Donovan, Los Angeles, \$247,361; Guy F. Atkinson, San Francisco, \$277,893; Geo. Mitchell Co., Huntington Park, \$323,296; Herbert M. Baruch, Los Angeles, \$350,049; Francisco & Ellington, Inc., Los Angeles, \$318,629; Isbell Construction Co., Fresno, \$298,561; George Pollock, Sacramento, \$270,842; Nevada Contracting Co., Fallon, Nevada, \$317,097; Crook & Henne, Los Angeles, \$384,211; Campbell-Reichert Co., Alhambra, \$284,492; Eltinge T. Brown, Los Angeles, \$303,414; C. G. Willis & Son, Los Angeles, \$288,903; Edson J. Davis, Venice, \$397,087. Contract awarded to H. W. Rohl Co., Los Angeles, \$244,532.40.

MADERA COUNTY—Near Califa, subway crossing under S. P. tracks; consisting of 2 concrete abutments with wing walls, grading 280-foot approaches with Portland cement concrete. Dist. VI, Rt. 4, Sec. C. Fredrickson & Watson Const. Co., Oakland, \$34,951; Healy & Tibbetts Const. Co., San Francisco, \$38,857; Ward Engineering Co., San Francisco, \$46,346; H. C. Whitty, Sanger, \$34,429; A. J. Grier, Oakland, \$38,992; C. Dudley Velbiss, Oakland, \$34,559; Robert Heaney, Hayward, \$38,425; The Adams Co., Angels Camp, \$39,564; Noble & Clark, Visalia, \$35,280; MacDonald & Kahn, Inc., San Francisco, \$41,348. Contract awarded to Otto Parlier, Tulare, \$31,463.20.

MONO COUNTY—Between Matty Ranch and Lee-vining, 2.2 miles to be graded and surfaced with crusher run base, bituminous surfaced treated. Dist. IX, Rt. 23, Secs. G & H. Contract awarded to C. Miles, Sacramento, \$54,567. (Only one bid submitted.)

NAPA COUNTY—Between Napa and Greenwood Corner, 5.3 miles to be widened with oil-treated rock borders. Dist. IV, Rt. 8, Sec. B. A. Teichert & Son, Sacramento, \$15,992; L. C. Seidel, Oakland, \$15,052. Contract awarded to Smith Bros. Co., Eureka, \$14,772.50.

NAPA COUNTY—Between Napa Wye and Solano County line, 3.1 miles to be graded and surfaced with bituminous macadam. Dist. IV, Rt. 8, Sec. B. Tieslau Bros., Berkeley, \$82,237; Hemstreet & Bell, Marysville, \$80,681; M. J. Vevanda, Stockton, \$73,533; J. E. Johnston, Stockton, \$76,452. Contract awarded to Fredrickson & Watson, Oakland, \$69,004.60.

NEVADA AND PLACER COUNTIES—Between Soda Springs and Donner Lake, 6.9 miles of bituminous surface treatment. Dist. III, Rt. 37, Secs. B, G & C. L. C. Seidel, Oakland, \$19,846. Contract awarded to Meyer Rosenberg, San Francisco, \$18,533.50.

ORANGE COUNTY—Between Serra and San Juan Capistrano, 0.7 of a mile to be graded and paved with Portland cement concrete. Steele Finley, Santa Ana, \$35,755; Geo. Mitchell Co., Huntington Park, \$40,823; Gruce Bros., Inc., Long Beach, \$39,170; Wells & Bressler Co., Santa Ana, \$42,214; McCray Co., Los Angeles, \$40,123; C. R. Butterfield, San Pedro, \$34,863; Basich Bros. Const. Co., Los Angeles, \$34,744; C. G. Willis & Son, Los Angeles, \$36,820. Contract awarded to Match Bros., Elsinore, \$31,751.

PLACER, YUBA, YOLO AND COLUSA COUNTIES—Pla. Co., between Roseville and one-half mile N. Andora Subway, 1.4 Mi.; Yuba Co., between Dry Cr. & Morrison's Crossing, 1.5 Mi.; Yolo Co., between Bretana & Dunnigan, 5.8 Mi.; Colusa Co., between Geneva (Berlin) & 2.6 Mi. N., 2.6 Mi.; total 11.3 miles to be surfaced with bituminous macadam and widened with untreated and oil-treated crushed gravel or stone. Dist. III, Rts. 3 & 7, Secs. A, C & B. C. W. Wood, Stockton, \$62,712; U. B. Lee, San Leandro, \$69,960. Contract awarded to J. E. Johnston, Stockton, \$58,700.

SAN BENITO AND MONTEREY COUNTIES—From 7 miles north of Salinas to San Juan, 2.4 miles to be surfaced with bituminous macadam. Dist. V, Rt. 2, Sec. A. Granite Const. Co., Watsonville, \$12,450. Contract awarded to W. A. Dontanville, Salinas, \$9,909.

SAN BERNARDINO COUNTY—Between Barstow and 1 mile east of Yermo, 13 miles to be graded and surfaced with oil-treated crushed gravel or stone. Dist. VIII, Rt. 31, Secs. G & H. A. D. Drumm, Jr., Fallon, Nevada, \$179,057; Isbell Const. Co., Fresno, \$201,424; S. J. Hales, Santa Ana, \$176,405; Dillon & Boles, Los Angeles, \$206,584; Edson J. Davis, Venice, \$176,832. Contract awarded to George Herz & Co., San Bernardino, \$169,695.85.

SAN DIEGO COUNTY—Between Balboa Ave. and Torrey Pines Road, 5.4 miles to be graded. Dist. VII, Rt. 2, Sec. E. De Waard & Son, San Diego, \$110,564; Ignace P. Lipp, Hollywood, \$154,851; McWilliams and Ritchey, Los Angeles, \$151,198; Yglesias Bros., Inc., San Diego, \$123,786; Crook & Henna, Los Angeles, \$142,381; Campbell-Reichert, Alhambra, \$134,613; J. D. Harms, Los Angeles, \$115,061; E. L. Gates, Sacramento, \$161,729; Geo. Pollock, Sacramento, \$131,093; Lewis Const. Co., Los Angeles, \$112,953; W. T. Malcom, Walnut Creek, \$130,937; South Coast Land Co., Los Angeles, \$199,745; Geo. Mitchell Co., Huntington Park, \$166,884; Wells & Bressler, Santa Ana, \$175,025; Triangle Rock and Gravel, San Bernardino, \$127,140; McCray Co., Los Angeles, \$124,502; J. G. Donovan & Son, Los Angeles, \$128,876; Jahn & Bressi, Los Angeles, \$116,783; Watson & Sutton, San Diego, \$113,009; Dimmitt & Taylor, Los Angeles, \$155,270; C. R. Butterfield, San Pedro, \$140,141; Nelson & Sloan, Chula Vista, \$145,762; Isbell Const. Co., Fresno, \$131,721; C. G. Willis & Son, Inc., Los Angeles, \$111,620. Contract awarded to R. E. Hazard Contracting Co., San Diego, \$106,830.80.

SAN DIEGO COUNTY—Between Miller Creek and Tecate Divide, 3.9 miles to be graded. Dist. VII, Rt. 12, Sec. F. International Transfer & Warehouse Co., Calexico, \$94,627; Mathews Const. Co., Sacramento, \$112,488; Watson & Sutton, San Diego, \$112,067; C. G. Willis & Sons, Inc., Los Angeles, \$86,827; J. G. Donovan & Son, Los Angeles, \$125,631; C. R. Butterfield, San Pedro, \$98,295; Isbell Const. Co., Fresno, \$92,358; Nevada Contracting Co., Fallon, Nevada, \$88,371. Contract awarded to Monarch & Breen, Portland, \$73,897.20.

SAN DIEGO COUNTY—Reinforced concrete girder bridge across Rose Canyon in San Diego near Balboa Ave. Dist. VII, Rt. 2, Sec. E. Barclay & Schaniel, San Diego, \$32,560; Dawson and Johnston, San Diego, \$35,458; McWilliams and Ritchey, Los Angeles, \$37,896; Greene Construction Co., Los Angeles, \$34,896; John Simpson & Co., Los Angeles, \$44,458; Geo. Mitchell Co., Huntington Park, \$39,100; Oberg Bros., Los Angeles, \$33,562; R. R. Bishop, Long Beach, \$31,879; A. R. and C. O. Bodenhamer, Hemet, \$41,607. Contract awarded to De Waard & Son, San Diego, \$30,515.

SAN JOAQUIN COUNTY—Between 2.5 miles north of Turner Station and Mariposa Road, 1.1 miles to be graded and surfaced with untreated crushed gravel or stone. Dist. N, Rt. 4, Sec. E. J. R. Reeves, Sacramento, \$31,445.50; Gannon & McCarty, Stockton, \$36,090; M. J. Bevanda, Stockton, \$33,527. Contract awarded to Lilly, Willard & Biasotti, Stockton, \$30,428.

SAN MATEO, SANTA CLARA AND SANTA CRUZ COUNTIES—Between La Honda and Saratoga Gap, 13.8 miles to be stockpiled with crushed gravel or stone. Dist. IV, Rt. 55, Secs. D, E & A. A. Teichert & Son, Sacramento, \$19,270. Contract awarded to Tieslau Bros., Berkeley, \$18,245.

SANTA BARBARA COUNTY—Between Los Alamos and 6½ miles north, constructing at different locations, 2.4 miles of bituminous macadam surface. Dist. V, Rt. 2, Sec. B. Sam Hunter, Santa Barbara, \$11,599. Contract awarded to M. J. Bevanda, Stockton, \$11,551.

TULARE COUNTY—Between southerly boundary and Pixley, 12.2 miles to be graded and paved with asphaltic concrete. Dist. VI, Rt. 4, Sec. A. Force, Currgan & McLeod, Oakland, \$312,672; Steele Finley, Santa Ana, \$308,725; Hanrahan Co., San Francisco, \$322,012; A. Teichert & Son, Sacramento, \$328,908; Western Roads Co., Oakland, \$327,957; Gibbons & Reed Co., Burbank, \$339,530; R. E. Hazard Co., San Diego, \$308,735; Chas. U. Hauser, Glendale, \$392,266; George R. Curtis, Los Angeles, \$320,303; Union Paving Co., San Francisco, \$389,624. Contract awarded to Valley Paving Co., Visalia, \$287,674.

AWARD OF CONTRACTS DIVISION OF ARCHITECTURE

STOCKTON ARMORY—Sorensen and Hagmark of San Francisco—For general work on additional buildings for the Stockton State Armory. Contract price, \$21,300.

F. C. Brandt of Stockton—For plumbing on above buildings. Contract price, \$2,328.

STATE AGRICULTURAL PARK, Sacramento—Campbell Construction Company—Main entrance gate to the State Fair Grounds. Contract price, \$1,550.

PATTON STATE HOSPITAL—Orviall Schupbach of Riverside—For general work on a unit for tubercular males. Contract price, \$35,663.

Harry M. Rouse, Riverside—For electrical work in the kitchen and bakery building. Contract price, \$4,476.

Security Construction Company of Riverside—For general work for the kitchen and bakery building. Contract price, \$79,950.

F. B. Jones, Pasadena—For heating and plumbing work on unit for tubercular males. Contract price, \$6,284.

PRESTON SCHOOL OF INDUSTRY—Collins Electrical Company of Stockton—For electrical work on Refectory Buildings. Contract price, \$2,581.

WHITTIER STATE SCHOOL—Saunders Brothers, Whittier—For installation of water pipe line and pump. Contract price, \$11,452.

PIO PICO MANSION (near Whittier, Los Angeles County)—T. R. Hyatt of Alhambra—For construction of caretaker's cottage. Contract price, \$1,560.

STATE CAPITOL BUILDING—Schrader Iron Works—For structural steel alterations. Contract price, \$2,285.

WATER PERMITS AND APPLICATIONS

Applications for Permit to Appropriate Water Filed with the State Department of Public Works, Division of Water Resources, During August, 1929.

Application 6390, INYO COUNTY—C. H. Devenso and Edward Schober, Bishop, for .33 c.f.s. from unnamed spring tributary to no stream to be diverted in Sec. 10, T. 21 S, R. 39 E., M. D. M. for domestic and agricultural purposes on 40 acres.

Application 6391, HUMBOLDT COUNTY—Thos. H. Salvage, Eureka, for .01 c.f.s. from unnamed spring tributary to Mattole River to be diverted in Sec. 30, T. 2 S., R. 1 W., H. M., for irrigation and domestic purposes on 8 acres. Estimated cost \$300.

Application 6392, HUMBOLDT COUNTY—P. M. Schmook, Scotia, for .017 c.f.s. from Eel River to be

diverted in Sec. 31, T. 2 N., R. 1 E., H. M., for irrigation purposes on 1.51 acres. Estimated cost \$400.

Application 6393, STANISLAUS COUNTY—Lloyd B. and Elizabeth M. Crow, San Francisco, for 7.5 c.f.s. from San Joaquin River to be diverted in Sec. 17, T. 6 S., R. 9 E., M. D. M., for irrigation purposes on 480 acres. Estimated cost \$600.

Application 6394, LASSEN COUNTY—Richard Talbot, Portland, Oregon, for 20,000 acre feet from Deep Cut Creek tributary to Secret Creek to be diverted in Sec. 19, T. 31 N., R. 16 E., M. D. M., and Sec. 24, T. 31 N., R. 15 E., M. D. M., for irrigation and domestic purposes on 8000 acres.

Application 6395, SIERRA COUNTY—Belle C. Brown and Wm. S. Brown, La Porte, for 65 c.f.s. from Whisky Creek and an unnamed ravine tributary to Slate Creek and North Fork Yuba River to be diverted in Sec. 16, T. 22 N., R. 10 E., M. D. M., for mining purposes. Estimated cost \$2,000.

Application 6396, SIERRA COUNTY—Belle C. Brown and Wm. S. Brown, La Porte, for 25 c.f.s. from North Branch of Slate Creek tributary to Slate Creek and North Fork Yuba River to be diverted in Sec. 21, T. 22 N., R. 10 E., M. D. M., for mining purposes. Estimated cost \$1,000.

Application 6397, SAN JOAQUIN COUNTY—W. H. McFall, Manteca, for 1.47 c.f.s. from Lone Tree Creek tributary to San Joaquin River to be diverted in Sec. 14, T. 1 S., R. 7 E., M. D. M., for irrigation purposes on 117.45 acres. Estimated cost \$1,000.

Application 6398, LASSEN COUNTY—Antone Avilla, Adin, for 33 ac. ft. from Quaking Asp Gulch tributary to Pit River to be diverted in Sec. 7, T. 36 N., R. 10 E., for stock watering purposes. Estimated cost \$200.

Application 6399, VENTURA COUNTY—Senior Canyon Mutual Water Co., Inc., Ojai, for 1 c.f.s. from a tunnel tributary to Senior Canyon to be diverted in Sec. 21, T. 5 N., R. 22 W., S. B. M., for domestic and irrigation purposes on 160 acres. Estimated cost \$65,000.

Application 6400, RIVERSIDE COUNTY—O. P. Sanders, Riverside, for .25 c.f.s. from unnamed spring tributary to no stream to be diverted in Sec. 8, T. 4 S., R. 2 E., S. B. M., for domestic and irrigation purposes on 20 acres. Estimated cost \$750.

Application 6401, CALAVERAS COUNTY—Ralph G. Houston and Raymond W. Miller, trustees for district to be formed, Linden, for 150 c.f.s. and 100,000 ac. ft. from Calaveras River tributary to San Joaquin River to be diverted in Sec. 31, T. 4 N., R. 11 E., M. D. M., for irrigation and domestic purposes on 12,000 acres.

Application 6402, SAN BERNARDINO COUNTY—T. E. Hunt, 322 S. Vendome St., Los Angeles, for 10 c.f.s. from Arrastre Creek and Baldwin Lake to be diverted in Sec. 22, T. 3 N., R. 2 E., S. B. M., for irrigation and domestic purposes on 800 acres. Estimated cost \$90,000.

Application 6403, EL DORADO COUNTY—Lora J. Knight, Santa Barbara, for 1 c.f.s. from unnamed spring tributary to Lake Tahoe to be diverted in Sec. 21, T. 13 N., R. 17 E., M. D. M., for irrigation and domestic purposes on 40 acres. Estimated cost \$2,000.

Application 6404, EL DORADO COUNTY—Geo. Cunningham, Lotus, for 2½ c.f.s. from South Fork American River to be diverted in Sec. 18, T. 11 N., R. 10 E., M. D. M., for mining purposes. Estimated cost \$1,200.

Application 6405, SAN BERNARDINO COUNTY—J. E. Honck, Box 47, Sky Forest, for .25 c.f.s. from 2 springs tributary to Hook Creek and Deep Creek

to be diverted in Sec. 26, T. 2 N., R. 2 W., S. B. M., for domestic purposes. Estimated cost \$2,500.

Application 6406, RIVERSIDE COUNTY—Metropolitan Water District of Southern California, Los Angeles, for 3000 c.f.s. from Colorado River to be diverted in Sec. 14, T. 3 S., R. 23 E., S. B. M., for municipal purposes for cities and inhabitants of said district.

Application 6407, SISKIYOU COUNTY—Fred J. Blakeley, Portland, Oregon, for 25 c.f.s. and 2000 ac. ft. from Elliott Creek tributary to Applegate River to be diverted in Sec. 21, T. 48 N., R. 10 W., M. D. M., for irrigation, domestic and industrial purposes. Estimated cost \$50,000.

Application 6408, SIERRA COUNTY—L. E. Granger, Nevada City, for 3 c.f.s. from Kimberland Ravine tributary to Kanaka Creek and Middle Yuba River to be diverted in Sec. 8, T. 18 N., R. 10 E., M. D. M., for power purposes. Estimated cost \$500.

Application 6409, SISKIYOU COUNTY—Telluric Mines and Power Co., Seattle, Wash., for 6 c.f.s. from Knownothing Creek to be diverted in Sec. 1, T. 9 N., R. 7 E., H. M., for power purposes. 205 t.h.p. to be developed. Estimated cost \$52,000.

Application 6410, EL DORADO COUNTY—Emil E. Larson, Placerville, for .5 c.f.s. from South Fork Brush Canyon tributary to South Fork American River to be diverted in Sec. 4, T. 10 N., R. 12 E., M. D. M., for irrigation and domestic purposes on 60 acres.

Application 6411, SIERRA COUNTY—Standard Mining Co., Downieville, for 2.50 c.f.s. from Sailor Ravine tributary to North Fork Yuba River to be diverted in Sec. 22, T. 20 N., R. 10 E., M. D. M., for power purposes. Estimated cost \$2,000.

Application 6412, YUBA COUNTY—Maurice E. Lawton, Strawberry Valley, for .05 c.f.s. from Stickner Spring tributary to Sly Creek to be diverted in Sec. 20, T. 20 N., R. 8 E., M. D. M., for operation of hydraulic ram. Estimated cost \$600.

Application 6413, LASSEN COUNTY—Antonio Saralegui, Reno, Nevada, for 10,000 ac. ft. from Long Valley Creek to be diverted in Sec. 10, T. 23 N., R. 17 E., M. D. M., for irrigation purposes. Estimated cost \$25,000.

Application 6414, EL DORADO COUNTY—Raymond A. Young, Sacramento, for 200 g.p.d. from unnamed spring tributary to Bryant Creek to be diverted in Sec. 15, T. 11 N., R. 17 E., M. D. M., for domestic purposes. Estimated cost \$25.

Application 6415, SIERRA COUNTY—James W. Flannery, San Francisco, for 150 c.f.s. from Canyon Creek tributary to North Fork Yuba River to be diverted in Sec. 10, T. 21 N., R. 10 E., M. D. M., for mining purposes. Estimated cost \$125,000.

Application 6416, SISKIYOU COUNTY—Paul Harris, Walker, for 0.5 c.f.s. from Salt Creek tributary to Horse Creek to be diverted in Sec. 27, T. 49 N., R. 11 W., M. D. M., for irrigation purposes on 30 acres in Secs. 26 and 35, T. 47 N., R. 11 W., M. D. M. Estimated cost \$300.

Application 6417, LASSEN COUNTY—Antone Avilla, Adin, for 500 ac. ft. from Quaking Asp Gulch tributary to Pit River to be diverted in Sec. 13, T. 36 N., R. 9 E., M. D. M., for stock watering purposes. Estimated cost \$1,000.

Application 6418, SUTTER COUNTY—Rowena B. Coulter, Grimes, for 12.5 c.f.s. from Sacramento River tributary to Suisun Bay to be diverted in Sec. 13, T. 11 N., R. 2 E., M. D. M., for irrigation purposes on 500 acres.

Application 6419, SAN DIEGO COUNTY—Chicago Nippe Manufacturing Co., Los Angeles, for 4 c.f.s. and 1200 ac. ft. from surface and underground Live Oak Creek tributary to San Luis Rey River to be diverted in Sec. 33, T. 9 S., R. 3 W., S. B. M., for irrigation and domestic purposes on 877 acres in Sec. 33, T. 9 S., R. 3 W., S. B. M.

Application 6420, MONTEREY COUNTY—Geo. P. Tolman, Watsonville, for .01 c.f.s. from unnamed spring to be diverted in Sec. 6, T. 20 S., R. 5 E., M. D. M., for domestic purposes.

Application 6421, NEVADA COUNTY—Fletcher Hamilton, San Francisco, for 50 c.f.s. from Logan, Roscoe, Deadman, Rob Roy, Mt. Zion and Devil's Canyon tributary to South Fork Yuba River to be diverted in Secs. 25, 26 and 34, T. 18 N., R. 10 and 11 E., M. D. M., for mining purposes in Sec. 9, T. 17 N., R. 10 E., M. D. M.

Application 6422, RIVERSIDE COUNTY—F. Wm. Seggio, Riverside, for .007 c.f.s. from Mountain Lion Spring tributary to San Jacinto River to be diverted in Sec. 36, T. 3 S., R. 2 W., S. B. M., for irrigation and domestic purposes on Lot 2, Sec. 36, T. 3 S., R. 2 W., S. B. M., 4 acres. Estimated cost \$400.

Application 6423, DEL NORTE COUNTY—F. M. McAuliffe, Nevada Bank Building, San Francisco, for 500 c.f.s. and 300,000 ac. ft. from South Fork Smith River tributary to Smith River and Pacific Ocean to be diverted in Sec. 10, T. 16 N., R. 1 E., H. M., for power purposes. Estimated cost \$10,000,000.

Application 6424, SHASTA COUNTY—Laura E. Chandler, Castella, Shasta County, for .025 c.f.s. from Mullins Gulch tributary to Sacramento River to be diverted in Sec. 22, T. 38 N., R. 4 W., M. D. M. for irrigation and domestic purposes on 2 acres.

Permits to Appropriate Water Issued by the Department of Public Works, Division of Water Rights, during August, 1929.

Permit 3297, Application 6199, SAN BERNARDINO COUNTY—Issued to W. G. Van Slyke, Needles, Aug. 5, 1929, for 1 c.f.s. from Piute Stream in Sec. 18, T. 12 N., R. 19 E., S. B. M., for use of irrigation and domestic purposes on 160 acres. Estimated cost \$3,000.

Permit 3298, Application 6281, INYO COUNTY—Issued to the Pan-Inyo Mining Co., 412 Central Bldg., Pasadena, Aug. 5, 1929, for 5 c.f.s. from Jail Canyon Stream in Sec. 14, T. 20 S., R. 44 E., M. D. M., for mining, milling and domestic use. Estimated cost \$2,500.

Permit 3299, Application 6305, MENDOCINO COUNTY—Issued to Chas. S. Howard Co., San Francisco, Aug. 8, 1929, for 4.46 c.f.s. and 300 a.f. from Forsythe Creek in Sec. 18, T. 17 N., R. 13 W., M. D. M., for irrigation of 357 acres. Estimated cost \$23,000.

Permit 3300, Application 6197, TRINITY COUNTY—Issued to H. W. Hamilton, Willow Creek, Aug. 9, 1929, for 8 c.f.s. from Hemmessey Creek in Secs. 3, 10 and 11, T. 5 N., R. 6 E., M. D. M., for mining purposes. Estimated cost \$1,800.

Permit 3301, Application 5944, CALAVERAS COUNTY—Issued to Fino Gold Mine Co., San Francisco, Aug. 9, 1929, for 35 c.f.s. from South Fork Mokelumne River in Sec. 29, T. 6 N., R. 14 E., M. D. M., for power purposes. 44 t.p.h. to be developed. Estimated cost \$4,000.

Permit 3302, Application 5950, EL DORADO COUNTY—Issued to Frank A. Brown, San Francisco,

Aug. 10, 1929, for 200 g.p.d. from unnamed stream in Sec. 34, T. 12 N., R. 17 E., M. D. M., for domestic purposes. Estimated cost \$100.

Permit 3303, Application 6262, AMADOR COUNTY—Issued to Pacific Gas & Electric Co., San Francisco, Aug. 13, 1929, for 550 c.f.s. from North Fork Mokelumne River in Sec. 33, T. 8 N., R. 16 E., M. D. M., for power purposes. Estimated cost \$800,000.

Permit 3304, Application 6235, SISKIYOU COUNTY—Issued to Riverside School District, Walker, Aug. 13, 1929, for .009 c.f.s. from a spring in Sec. 10, T. 46 N., R. 9 W., M. D. M., for domestic use. Estimated cost \$300.

Permit 3305, Application 6236, TRINITY COUNTY—Issued to New River Mining & Development Co., Denney, Aug. 13, 1929, for 50 c.f.s. from New River in Sec. 27, T. 7 N., R. 7 E., H. M., for mining purposes. Estimated cost \$10,000.

Permit 3306, Application 6239, SIERRA COUNTY—Issued to Addison Brown and C. J. York, Downieville, Aug. 13, 1929, for 5 c.f.s. from Slug Canyon and Holloman Ravine in Sec. 3, T. 19 N., R. 10 E., M. D. M., for power purposes. Estimated cost \$2,500.

Permit 3307, Application 6343, INYO COUNTY—Issued to American Potash & Chemical Corp., Trona, Aug. 21, 1929, for 0.0067 c.f.s. from Moscow Creek No. 1, Sec. 31, T. 23 S., R. 42 E., M. D. M., for industrial, domestic and mining purposes. Estimated cost \$11,500.

Permit 3308, Application 6344, INYO COUNTY—Issued to American Potash & Chemical Corp., Trona, Aug. 21, 1929, for 0.0067 c.f.s. from Moscow Creek No. 2 in Sec. 31, T. 23 S., R. 42 E., M. D. M., for mining, domestic and industrial purposes. Estimated cost \$1,210.

Permit 3309, Application 6345, INYO COUNTY—Issued to American Potash & Chemical Corp., Trona, Aug. 21, 1929, for 0.2222 c.f.s. from Moscow Creek No. 3, in Sec. 31, T. 23 S., R. 42 E., M. D. M., for mining, domestic and industrial purposes. Estimated cost \$1,430.

Permit 3310, Application 6346, INYO COUNTY—Issued to American Potash & Chemical Corp., Trona, Aug. 21, 1929, for 0.0111 c.f.s. from Moscow Creek No. 4, in Sec. 6, T. 24 S., R. 42 E., M. D. M., for mining, domestic and industrial purposes. Estimated cost \$1,210.

Permit 3311, Application 6347, INYO COUNTY—Issued to American Potash & Chemical Corp., Trona, Aug. 21, 1929, for .0067 c.f.s. from Knockout Spring in Sec. 31, T. 23 S., R. 42 E., M. D. M., for mining, domestic and industrial purposes. Estimated cost \$2,300.

Permit 3312, Application 5658, SAN BERNARDINO COUNTY—Issued to Geneva Katherine Baxter, Victorville, Aug. 23, 1929, for 2 c.f.s. from Scionaca or Cinka Springs in Sec. 13, T. 3 N., R. 1 W., S. B. M., for irrigation and domestic purposes. Estimated cost \$12,000.

Permit 3313, Application 6340, SANTA BARBARA COUNTY—Issued to United States Santa Barbara National Forest, Santa Barbara, Aug. 23, 1929, for .01 c.f.s. from two unnamed springs, in Sec. 29, T. 6 N., R. 27 W., S. B. M., or domestic purposes. Estimated cost \$500.

Permit 3314, Application 6296, SANTA CLARA COUNTY—Issued to Board of Trustees of The Leland Stanford University, Stanford University, Aug. 29, for 900 acre feet per annum from Los Trancos Creek in Sec. 28, T. 6 S., R. 3 W., M. D. M., for irrigation and domestic purposes. Estimated cost \$150,000.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Permit 3315, Application 6287, BUTTE COUNTY—Issued to Ralph J. Baxter, Durham, Aug. 29, 1929, for 1.3 c.f.s. from Clear Creek in Sec. 14, T. 21 N., R. 3 E., M. D. M., for irrigation of 104 acres. Estimated cost \$500

Permit 3316, Application 6286, NEVADA COUNTY—Issued to Lincoln Hutchinson, San Francisco, Aug. 31, 1929, for .01 c.f.s. from Zoro Spring in Sec. 24, T. 17 N., R. 14 E., M. D. M., for domestic purposes. Estimated cost \$200

Permit 3317, Application 6228, LOS ANGELES COUNTY—Issued to Herman G. Willday, Palmdale, Aug. 31, 1929, for 600 gallons per day from a spring in Sec. 3, T. 4 N., R. 12 W., S. B. M., for domestic purposes. Estimated cost \$150.

Permit 3318, Application 6263, EL DORADO COUNTY—Issued to B. G. Cutler, Marysville, Aug. 31, 1929, for 200 gallons per day from unnamed spring in Sec. 6, T. 11 N., R. 18 E., M. D. M., for domestic purposes. Estimated cost \$100.

PROPERTY OWNERS AGREE TO PROPER SETTING FOR SAN DIEGO COLLEGE

Agreement has been reached by the Department of Public Works with adjoining property owners at San Diego as to landscape development of the campus of the new college taken together with the adjoining properties. This assures satisfactory approaches and surroundings for the college.

Oh, bury him deep
In some shady bower:
He drives in the middle
At ten miles per hour.

PENNSYLVANIA—An analysis of motor vehicle accidents occurring in one winter month revealed that 494 accidents, resulting in 27 deaths and 467 injuries, were due primarily to skidding. Accidents at bridges, numbering 50, caused 2 deaths and 48 injuries. A total of 3499 mishaps causing 185 deaths was recorded for that month.

LOUISIANA—Hard surfacing of 1650 miles on four main highways is part of the state highway program for the next two years. Two north-and-south and two east-and-west routes are to be continuously surfaced, including the Jefferson Highway and the Old Spanish Trail.

ILLINOIS—Mixers laying pavement on state highways during the past eight years, have had an average per-season mileage varying from 2.70 to 6.97 miles for individual years. In 1928, 45 per cent of the mixers were 6-bag. Equipment charges on representative paving jobs included 10.1 cents per square yard for repairs and 5.5 cents for fuel.

UTAH—Maintenance costs for various state road types during 1927 averaged: \$310 per mile for 204 miles of concrete, \$388 per mile for 55 miles of bituminous surfaces, and \$337 per mile for 1048 miles of gravel, not including new gravel added. Gravel roads carried an average daily traffic of 337 vehicles according to a check at 45 stations.

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

B. B. MEEK.....Director
GEORGE C. MANSFIELD.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 7 SEPTEMBER, 1929 No. 9

REGISTRATION FEES

The gross receipts of paid registration motor vehicle fees in California were \$9,381,176.95 for the period of January 1, 1929-July 31, 1929, inclusive. This is an increase of \$1,238,139.45 for the corresponding period in 1928. The registration of automobiles, motorcycles, trucks and trailers for this period exceeded the same period in 1928 by 160,167.

HIGHWAYS ARE HAPPY WAYS

By PLATT YOUNG, in Georgia Highways Magazine

Highways are happy ways. Their smile expands
O'er mountains, hills, and peaceful meadow lands;
The nodding trees, the laughter of the brooks,
The budding flora of sequestered nooks,
Reflect that smile, which brings surcease from care
And promises each pilgrim rapture there.

Highways are happy ways, and link the plan
Instilled by Nature in the heart of man
To make a common way where miser blends
His lot with him who all his substance spends:
For since Creation's dawn, there is no fee
To God's outdoors. Its wealth is scattered free.

Rastus had taken Mandy to the circus menagerie and was having a great time explaining all about the animals to his girl.

"Lawzee, Rastus, what's 'at?" asked Mandy, when they came to the zebra.

"Don't you know, gal You sho' has neglected yo' animology. Dat's nuthin' but a spo't model jackass."

A young London girl holidaying in the country became rather friendly with a young farmer. One evening as they were strolling in the fields they happened across a cow and a calf rubbing noses in the accepted bovine fashion.

"Ah," said the young farmer, "that sight makes me want to do the same."

"Well, go ahead," said the girl, encouragingly. "It's your cow."

Fair Maid: "Oh, sir, what kind of an officer are you?"

Officer: "I'm a naval surgeon."

Fair Maid: "Goodness, how you doctors do specialize."

TRAVEL COUNT INDICATES
DOUBLE PRESENT HIGHWAY
TRAFFIC BY 1940

(Continued from page 1.)

Station location	July, 1928		July, 1929	
	Sun. 15	Mon. 16	Sun. 14	Mon. 15
Belvedere Jc. R. 52 to Belvedere.				
S. on 1.....	12,071	5,275	14,516	6,407
E. on 52.....	2,205	1,060	2,035	1,109
N. on 1.....	11,127	4,323	13,749	5,870
San Rafael N. of Cy. at top hill.....	12,226	4,807	12,253	4,653
Petaluma S. Cy. Lts. at Maint.				
Yd.	8,098	3,477	9,053	3,978
Petaluma N. of Cy.....	10,813	6,539	10,570	5,372
Cotati at Jct. C.R. to Sebastopol.				
S. on 1.....	11,222	4,028	9,839	4,135
W. on C.R.....	6,903	2,271	5,508	1,832
N. on 1.....	4,617	2,533	4,499	2,684
Santa Rosa S. of Cy. at Triangle				
Service Sta.	4,606	2,967	3,675	4,531
Santa Rosa N. of Cy. at S. P.				
R. R. Xing.....	5,399	3,846	6,330	4,573
Healdsburg S. of Cy. at N. W.				
P. R. R. Xing.....	4,055	2,602	4,526	3,146
Mountain House at Jct. Rt. 48 to				
Boonville.....				
S. on 1.....	1,681	1,270	2,380	1,680
W. on 48.....	275	316	432	278
N. on 1.....	1,413	969	1,954	1,402
McCrays Jct. C.R. to Preston.				
S. on 1.....	2,192	1,369	2,608	1,872
E. on C.R.....	418	244	366	228
N. on 1.....	2,199	1,581	2,250	1,643
Hopland at Jct. Rt. 16 to Lakeport.				
S. on 1.....	1,871	1,425	2,247	1,874
E. on 16.....	776	808	711	787
N. on 1.....	2,525	2,217	2,948	2,643
Ukiah S. of Cy. Lts. Jc. with Rt. 70.				
S. on 1.....	1,904	1,639	2,340	2,003
E. on 70.....	873	960	1,061	1,006
N. on 1.....	2,378	2,334	3,136	2,747
Ukiah N. of Cy. Lts. at Jc. Rt. 15				
to Colusa.....				
S. on 1.....	2,254	1,756	2,694	2,235
E. on 15.....	889	620	1,019	749
N. on 1.....	1,667	1,273	2,025	1,623
District I				
Willits N. of Cy. at Jc. C.R. to				
Sherwood.....				
S. on 1.....	1,195	997	1,486	1,371
W. on C.R.....	68	90	72	106
N. on 1.....	1,131	929	1,415	1,268
Mendocino-Hum. Co. Line.....	748	689	1,261	1,164
Garberville at Jc. with C.R. to				
Briceland.....				
S. on 1.....	1,207	1,280	1,511	1,482
W. on C.R.....	210	174	302	178
N. on 1.....	1,274	1,350	1,689	1,573
Dyerville at Jc. C.R. to So. Fork.				
S. on 1.....	1,539	1,210	2,326	1,620
E. on Cr.....	399	379	429	452
N. on 1.....	1,493	1,089	2,224	1,533
W. on C.R.....	226	124	261	187
Fernbridge Jc. C.R. to Ferndale.				
S. on 1.....	3,168	1,720	3,564	2,318
W. on C.R.....	1,109	787	1,085	822
N. on 1.....	3,168	1,772	3,498	2,359
Eureka S. of Cy. Lts.....	4,054	2,995	4,655	3,832
Eureka N. at Eureka Slough				
Bridge.....	3,657	2,402	4,245	3,483
Arcata N. of Cy. at Jc. Rt. 20				
to Weaverville.....				
S. on 1.....	1,448	780	1,274	874
E. on 20.....	1,647	831	1,388	934
N. on 1.....	354	123	293	114
Arcata at Mad River Store, E. on 1				
S. on C.R.....	426	140	430	301
N. on 1.....	2,191	1,101	2,702	1,832
Orick, Jc. Rt. 1 and C.R. to				
Weitchpec.....				
S. on 1.....	2,322	1,122	2,786	1,839
S. on 1.....	619	720	1,048	941
E. on C.R.....	112	65	77	49
N. on 1.....	581	697	1,081	925
Klamath River Br.....	487	541	1,150	1,048
Crescent Cy. S. E. of Cy. at Jc.				
Rd. to Crescent Cy.,				
S. on 1.....	1,060		1,745	1,942
N. to C. C.....	1,662		2,374	2,433
E. on 1.....	1,044		1,653	1,644

Station location	July, 1928		July, 1929	
	Sun. 15	Mon. 16	Sun. 14	Mon. 15
Hiouchi Bridge,				
E. on 1.....			662	509
W. on 1.....			584	415
C.R.			176	61
Curve Half Way up Oregon Mt.,				
N. Bound.....			429	
1 3/4 Mi. S. Oregon Line S. Bound			36	348
Oregon Line.....	578	472	863	773

Route 2. San Francisco to San Diego				
District IV				
Colma Jct. with Rd. 2 to So. S. F.,				
N. on 2.....	26,521	10,966	28,553	14,083
E. on C.R.....	3,332	1,667	4,535	2,337
S. on 2.....	23,189	9,299	24,018	11,746
San Bruno Jc. with Bay Shore				
road to So. S. F. R. 68,				
N. W. on 2.....	22,208	9,205	23,843	11,468
N. E. on 68.....	3,685	2,581	2,185	1,912
S. on 2.....	25,893	11,786	26,028	13,380
San Mateo S. of Cy. at 16th Ave.				
Redwood Cy. N. of Cy. Lts.....	29,163	12,698	27,084	15,124
Palo Alto at Highway to Federal				
Tel. Sta.....	18,700	8,774	19,957	10,284
9 Mi. N. of San Jose, N. on 2.....	10,907	7,928	12,815	8,038
W. on C.R.....	8,661	5,437	3,574	4,801
S. on 2.....	4,610	2,045	8,414	5,286
5 Mi. N. of San Jose.....	10,113	7,272	9,697	6,990
4 Mi. N. of San Jose.....	13,305	10,789	12,516	11,332
San Jose N. of Cy. Lts. at Lumber				
Yard.....	20,543	21,856	19,938	21,579
San Jose S. of Cy. Lts.....	10,151	8,652	10,433	8,342
5 Mi. S. of San Jose.....	7,549	4,316	8,133	4,965
10 Mi. S. of San Jose.....	7,324	4,499	8,250	5,077
15 Mi. S. of San Jose.....	7,473	4,323	8,140	4,894
Gilroy N. of Cy. at Jc. with Mt.				
Madonna Rd. to Watsonville,				
N. on 2.....	8,414	5,814	8,205	6,187
W. on C.R.....	1,652	1,016	1,287	778
S. on 2.....	8,547	6,017	8,429	6,357

Route 2. District V				
San Juan Bautista N. of Cy. at Jc.				
with R. 67 Chittenden Rd.,				
N. on 2.....	5,326	3,112	5,427	3,393
W. on 67.....	3,390	1,480	3,697	1,533
S. on 2.....	4,391	2,840	4,784	3,079
San Juan Bautista S. of Cy. at Jc.				
Rt. 22 to Hollister,				
N. on 2.....	4,658	3,184	5,411	3,797
E. on 22.....	2,662	1,525	3,001	1,780
S. on 2.....	3,496	2,408	3,741	2,822
S. Pt.-Mon. Co. Line.....	3,154	2,141	3,243	2,387
Salinas N. of Cy. Lts.....	6,229	4,794	6,365	5,490
Salinas S. of Cy. Lts.....	3,966	3,709	4,883	4,482
Gonzales 3 Mi. W. of Town.....	3,165	2,772	3,764	3,114
Soledad S. of Milk Plant.....	3,095	2,705	3,766	3,195
San Lucas S. of Cy. at Jc. R. 10				
to Coalinga and C.R. to Jolon,				
N. on 2.....	2,329	2,068	2,771	2,313
E. on 10.....	110	155	144	171
W. on C.R.....	86	139	90	149
S. on 2.....	2,250	2,000	2,664	2,248
Paso Robles N. of Cy. Lts.....	2,730	2,335	3,042	2,590
Paso Robles S. of Cy. Lts.....	3,488	2,777	4,127	3,216
San Luis Obispo N. of Cy. Lts.				
San Luis Obispo S. of Cy. Lts. at				
R. H. Xing.....	No count		6,510	4,728
At Pismo overhead crossing.....	4,654	3,159		
Santa Maria N. of Cy. at Jc.				
R. 57 to Bakersfield,				
N. on 2.....	4,036	2,742	4,619	3,141
E. on 57.....	203	96	244	168
S. on 2.....	4,056	2,776	4,624	3,223
Buellton at Intersection with Co.				
Rds. W. to Lompoc and Easterly,				
N. on 2.....	2,727	2,186	3,207	2,430
E. on C.R.....	488	373	481	367
W. on C.R.....	557	377	537	348
S. on 2.....	3,031	2,392	3,524	2,606
Gaviota W. of Road to Gaviota Sta.				
Orella, opposite Orella station.....	2,881	2,169	3,308	2,381
Santa Barbara W. of Cy. at Jc.				
San Marcos Rd., N. on 2.....	4,814	3,576	3,996	2,752
San Marcos Rd.....	5,560	3,532	6,544	5,046
S. on 2.....	1,183	345	945	380
Santa Barbara W. of Cy. Limits				
On 2.....	6,394	3,538	6,870	5,259
Santa Barbara 300 Ft. E. of Cy.				
Lts.....	6,297	5,406	8,411	6,821
S. B.-Ven. Co Line.....	9,524	7,708	12,755	10,539
	6,495	3,651	8,705	4,643

Route 2. District VII

Station location	July, 1928		July, 1929	
	Sun. 15	Mon. 16	Sun. 14	Mon. 15
Ventura W. of Cy. at Br.-----	8,059	4,616	10,466	6,081
Ventura E. of Cy. Lts.-----	7,472	5,672	11,667	7,552
El Rio Intersection.				
W. on 2-----	6,023	4,197	10,361	7,144
N. to Sateley-----	1,391	1,125	2,057	1,520
S. to Oxnard-----	3,844	2,940	9,522	5,302
E. on 2-----	6,603	4,330	5,297	2,945
Ventura-L. A. Co. Line-----	6,755	3,731	7,436	2,613
West of Hollywood-Ventura Blvd. at Sepulveda St.-----	11,702	6,439	12,036	5,592
L. A. E. at Indiana St.-----	22,356	21,311	23,303	20,850
Whittier at Jct. with Hadley St., W. on 2-----	16,364	11,881	20,661	14,070
N. on Hadley-----	3,296	3,595	4,171	4,729
E. on 2-----	14,068	9,027	16,513	10,493
La Habra E. Cy. Lts. at Jc. Roads to La Habra and Brea, N. on 2-----	8,672	4,173	11,534	5,456
W. to La Habra-----	4,774	2,793	3,126	2,791
E. to Brea-----	4,570	2,724	3,075	2,670
S. on 2-----	9,556	4,233	11,423	5,856
Anaheim N. of Cy. Lts.-----	14,927	9,731	15,074	10,112
Santa Ana N. of Cy. at Jc. C.R. to Orange, N. on 2-----	12,223	7,396	11,855	6,271
E. on C.R.-----	7,562	5,687	7,473	6,095
S. on 2-----	12,010	7,846	12,691	6,491
Tustin W. of Cy.-----	9,115	5,555	9,327	6,568
San Juan Capistrano N. of City Serra at Jct. Ora. 60-C with Ora. 2-A, N. of Jct.-----	4,945	2,230		
S.E. of Jct.-----			6,582	3,588
W. of Jct.-----			10,380	4,933
Oceanside Nr. S. Cy. Lts.-----	8,485	5,278	9,666	5,828
Delmar at S. F. R. R. Xing-----	8,005	3,838	9,456	4,721

Route 3. Sacramento to Oregon Line

District III

Sacramento N. at Jc. Garden Highway, S. on 3-----	13,233	12,611	*6,501	5,663
On Garden Highway-----	1,488	1,144	2,210	1,434
N. on 3-----	12,142	11,580	*6,574	6,171
Ben Ali Xing Jc. to C.R., S. on 3-----	6,853	4,578	*2,568	1,478
W. on C.R.-----	613	380	282	164
E. on C.R.-----	518	586	*2,887	1,886
N. on 3-----	6,740	4,995	Under construction	
Jc. C.R. to Folsom N. of 12 MI. House, S. on 3-----	5,100	4,022	*2,466	1,425
E. on C.R.-----	636	373	445	197
N. on 3-----	4,399	3,584	*1,846	1,283
Roseville S. of Cy. at N. end of Guard Rail Lane-----	6,016	4,165	5,335	3,548
Roseville, N. of Cy. Lts.-----	2,418	1,991	1,715	1,173
Marysville S. of Cy. at Jc. Ham- monton Road, S. on 3-----	2,393	2,025	1,535	1,272
Hm. Rd.-----	750	871	627	613
N. on 3-----	3,345	3,274	2,473	2,229
W. on C.R.-----	738	756	466	460
Yuba City N. of Cy. at Jc. Rt. 15, S. on 3-----	4,621	4,750	3,623	3,411
W. on 15-----	2,705	2,686	1,986	1,938
N. on 3-----	2,578	2,722	2,269	2,160
Richvale Wye Jc. Rt. 21 to Oroville, S. on 3-----	1,348	1,086	1,290	977
W. on 3-----	1,208	1,007	1,157	886
E. on 21-----	388	318	449	358
Chico at Jc. C.R. E. to De Sabla S. on 3-----	2,940	2,414	2,945	2,498
E. on C.R.-----	311	246	337	319
N. on 3-----	3,163	2,520	3,151	2,709
Chico N. of Cy. at Jc. C.R. East, S. on 3-----	2,318	2,063	2,151	2,014
E. on C.R.-----	478	322	433	255
N. on 3-----	1,900	1,758	1,809	1,818

Route 3. District II

Butte-Tehama Co. Line-----	1,056	921	1,057	973
Red Bluff E. at Jc. with Rt. 29 to Susanville, S. on 3-----	1,446	1,578	1,439	1,285
E. on 29-----	652	599	849	573
N. on 3-----	1,662	1,452	1,847	1,579
Cottonwood S. of town at Tehama- Shasta Co. Line-----	2,306	1,676	2,363	2,144

Station location	July, 1928		July, 1929	
	Sun. 15	Mon. 16	Sun. 14	Mon. 15
Redding S. of Cy. at Jc. with Rt. 28 to Alturas, S. on 3-----	2,203	2,057	2,225	2,217
E. on 28-----	527	567	665	654
N. on 3-----	2,583	2,515	2,721	2,749
Redding 3 Mi. N. at Jc. with C.R. to Kennett, S. on 3-----	1,583	1,454	668	614
W. on C.R.-----	46	28	44	32
N. on 3-----	1,581	1,350	854	681
Gibson-----	1,692	1,427	1,540	1,323
Dunsmuir 1.5 Mi. So., Dunsmuir N. Cy. Lts. at Br.-----	2,111	1,761	2,302	1,903
Dunsmuir 4 Mi. N. at Mott-----	3,700	3,375	4,603	3,276
Weed Jct. with Klamath Falls Rd., E. on Co. Rd. 3 Mi. E. of Weed-----	2,598	2,051	2,794	1,972
Gazelle 1 Mi. North-----	114	51	7	37
Yreka S. Cy. Lts.-----	1,801	1,497	1,716	1,538
Cray N. of Cy. at Jc. with Rt. 46 via Klamath Riv., S. on 3-----	2,431	2,342	2,456	2,277
W. on 46-----	1,604	1,335	1,590	1,320
N. on 3-----	405	208	348	202
Oregon Line-----	1,598	1,293	1,543	1,296
	1,568	1,372	1,599	1,351

Route 4. Sacramento to Los Angeles

District X

Sacramento S. of Cy. Lts.-----	7,174	6,591	8,364	6,739
7 Mi. House at intersection Florin Rd., N. on 4-----	4,233	3,097	5,026	3,313
E. on C.R.-----	842	600	821	680
W. on C.R.-----	117	82	107	96
S. on 4-----	3,976	2,850	4,655	2,992
Old Elk Grove at intersection Franklin-Elk Grove Rd., N. on 4-----	3,671	2,650	4,151	2,572
E. on C.R.-----	822	776	762	655
W. on C.R.-----	566	472	536	433
S. on 4-----	3,158	2,194	3,703	2,179
Twin Cities Jc. Rt. 34 to Jackson, N. on 4-----	2,900	2,139	3,569	2,245
E. on 34-----	375	287	456	342
S. on 4-----	3,193	2,218	3,667	2,304
Lodi Jc. Rt. 24 to San Andreas, N. on 4-----	3,318	2,587	3,875	3,068
E. on 24-----	1,548	1,180	1,725	1,285
S. on 4-----	4,413	3,130	5,002	3,667
Stockton N. of Cy. at Jc. C.R. to Lockeford, N. on 4-----	4,580	3,896		
E. on C.R.-----	3,102	2,815		
S. on 4-----	7,641	6,558		
Stockton N. of City at Cherokee Sta., N. E. on 4-----			3,841	2,387
S. W. on 4-----			3,568	2,278
S. E. on C.R.-----			434	260
Jc. of Mariposa Rd. S. of Stockton, W. on 4-----			3,107	2,234
S. on 4-----			1,938	1,517
E. on Mpa. Rd.-----			1,132	721
French Camp Jc. Rt. 5 to Oakland, N. on 4-----	2,441	1,693	3,447	2,488
S. W. on 5-----		Construction	2,707	1,942
S. E. on 4-----	2,235	1,486	812	626
Inters. McKinley Ave. and C. R. with old SJ-4-B. E. on McKin. On old SJ4B-----			2,522	1,991
W. on C.R.-----			1,831	1,495
Manteca N. of City-----	3,317	2,660	3,384	2,609
Ripon N. of City-----	5,010	3,613	5,362	4,021
Salida Jc. Rt. 13 to Sonora, N. on 4-----	5,331	3,803	5,285	3,903
E. on 13-----	380	344	421	404
S. on 4-----	5,390	4,089	5,302	3,966
Modesto N. of Cy.-----	7,389	6,258	7,282	6,212
Modesto S. of Cy. Jc. Crows Land- ing Road, N. on 4-----	8,778	8,801	9,576	2,535
S. on 4-----	7,106	5,618	7,178	6,211
W. on C.R.-----	2,573	2,555	2,556	2,367
Turlock N. of City-----	5,958	5,473	5,845	4,751
Turlock S. of City-----	4,986	3,996	4,579	3,791

Route 4. District VI

Stanislaus-Mer. Co. Line-----	4,000	3,154	4,134	3,531
Atwater N. of City-----	4,455	3,483	4,173	3,251
Merced N. Cy. Lts. at Br.-----	5,492	4,452	5,782	4,956
Merced S. Cy. Lts. at Br.-----	3,572	3,663	4,219	4,095
Merced-Madera Co. Line-----	2,589	1,931	3,084	2,213
Calif. Jct. Rt. 32 to Gilroy, N. on 4-----	2,585	1,989	3,251	2,358
W. on 32-----	870	695	1,142	818
S. on 4-----	2,909	2,662	4,376	3,093

*Construction under way Ben Ali to Sylvan Corner.

Station location	July, 1928		July, 1929		Station location	July, 1928		July, 1929	
	Sun.	Mon.	Sun.	Mon.		Sun.	Mon.	Sun.	Mon.
Orland at Jct. with Rt. 47 to Chico, on 7-----	1,827	2,456	1,745	1,585	Hanford W. of Cy. Lts.-----	1,612	2,025	1,919	2,084
E. on 47-----	698	652	812	665	Hanford E. of Cy. at Interx. Co. Rds. N. to Kingsburg & S. to Corcoran, W. on 10-----	3,236	3,092	3,621	2,949
Route 7. District II					N. on C.R.-----	1,825	1,668	2,105	1,666
Red Bluff S. of town at Read Cr. Bridge-----	1,757	1,942	1,929	1,709	S. on C.R.-----	1,736	1,582	1,807	1,512
Route 8. Ignacio to Cordelia via Napa					E. on 10-----	2,493	2,665	2,555	2,244
District IV					Goshen Jct. Jc. Rt. 14 N. to Fre E. to Visalia & South to Tulare, W. on 10-----	1,690	1,067	1,665	1,062
Petaluma Cr. Bridge-----	3,703	917	3,201	856	N. on 4-----	2,876	2,318	3,340	2,665
Schellville Jct. Rt. 51 to Santa Rosa, S. on 8-----	3,733	1,156	2,077	1,315	S. on 4-----	2,545	2,037	3,243	2,478
N. on 51-----	2,487	878	3,266	1,012	E. on 4-----	2,101	1,429	2,087	1,563
N. E. on 8-----	2,119	843	1,774	538	Visalia Wye Jc. Rt. 4 W. to Goshen & S. to Bakersfield and Rt. 10 E. to Visalia, W. on 4-----	2,798	2,235	2,912	2,607
Napa Junction Jct. Co. Rd. to Vallejo, N. on 8-----	6,961	2,719	7,049	3,029	S. on C.R.-----	2,412	1,562	2,316	1,649
S. on C.R.-----	9,282	4,016	6,989	3,007	E. on 10-----	4,572	3,625	4,545	3,874
E. on 8-----	5,260	2,885	*653	*382	Visalia E. of Cy. at Exeter Jct., W. on 10-----	2,391	2,064	2,327	2,008
Route 8. District X					S. to Exeter-----	1,443	1,233	1,224	1,175
Cordelia Jct. Rt. 7 (Old)-----	5,169	2,973			E. on 10-----	1,531	1,141	1,590	1,082
New Jct. Routes 7 and 8 at Cordelia, S. on 7-----			*3,434	*2,089	Lemon Cove Jc. C.R. to Woodlake, W. on 10-----	1,663	715	1,627	798
W. on 7-----			*584	*877	N. on C.R.-----	1,035	359	1,032	371
E. on 7-----			*3,442	*2,377	E. on 10-----	2,133	740	2,127	893
Route 9. San Fernando to San Bernardino					Three Rivers E. of town at Jct. C.R. northerly, W. on 10-----	1,403	502	1,398	574
District VII					N. on C.R.-----	245	102	182	82
Tujunga west of Sunset Blvd.-----	6,114	3,111	5,436	3,214	E. on 10-----	1,350	501	3,161	575
La Crescenta W. of Penn. Ave.-----	6,474	3,317	6,096	3,459	Route 11. Sacramento to Nevada Line via Placerville				
La Canada at School St.-----	7,210	4,065	6,033	3,585	District III				
Pasadena E. of Cy. Lts.-----	8,951	6,083	12,216	7,793	Sacramento E. of Cy. Lts.-----	4,352	2,971	5,026	2,885
Azusa W. City Limits-----	10,670	5,408	10,708	5,784	Perkins Jc. with C.R. to Plymouth, W. on 11-----	3,199	2,423	2,444	1,461
District VIII					S. E. on C.R.-----	1,276	877	1,332	857
S. Bd.-L. A. Co. Line-----	7,678	2,900	Not taken		E. on 11-----	2,910	1,690	2,058	1,247
W. on 9-----	2,873	1,539	Not taken		Folsom W. of Cy. Jct. Pratt Rd., W. on 11-----	1,945	1,081	1,907	977
S. W. on C.R.-----	2,274	1,305	Not taken		E. on C.R.-----	453	222	488	267
E. on 9-----	4,925	2,824	Not taken		E. on 11-----	1,603	928	1,792	863
Upland E. of Cy. at Jct. C.R. to Upland, W. on 9-----	2,873	1,539	Not taken		Folsom E. of town at High Sch., N. on 11-----			967	406
S. W. on C.R.-----	2,274	1,305	Not taken		E. on 11-----			741	386
E. on 9-----	4,925	2,824	Not taken		W. on C.R.-----			227	110
Upland at Euclid Ave. intersection, W. on 9-----	6,289	3,142	Not taken		El Dorado Jc. Rt. 65, W. on 11-----	1,206	497	1,422	709
N. on Eu. Ave.-----	3,932	2,349	Not taken		S. on 65-----	260	103	336	179
S. on Eu. Ave.-----	3,405	2,528	Not taken		E. on 11-----	869	531	1,035	620
E. on 9-----	4,245	2,216	Not taken		Placerville W. of City-----	2,175	1,446	2,823	1,433
S. Bd. W. of City-----	5,423	4,186	Not taken		Placerville E. of City-----	1,995	1,368	2,435	1,365
Route 10. San Lucas to Sequoia Ntl. Prk.					Between Riverton and Kyburz-----	1,112	702	1,549	779
District V					Alpine Jct., W. on 11-----	465	252	637	359
San Lucas S. of City at Jct. Rt. 2-----	110	155	144	171	S. on 23-----	128	103	117	93
Route 10. District VI					E. on 11-----	404	306	625	366
Monterey-Fresno Co. Line-----	113	47	148	72	Jc. Rt. 38 to Lake Tahoe, W. on 11-----	553	324	713	411
Parkfield Jct. W. on 10-----	170	122	289	112	N. on 38-----	301	217	407	293
S. on C.R.-----	64	31	137	46	E. on 11-----	166	127	183	147
E. on 10-----	228	135	212	149	Lakeside at Connollys Ser. Sta. Jc. C.R. to Bijou, W. on 11-----	208	130	188	145
Coalinga S. of City-----	383	319	690	568	N. on C.R.-----	393	342	460	346
Coalinga 3 MI. E. at Jct. C.R. to Oilfields, W. on 10-----	682	702	726	789	E. on 11-----	440	348	561	452
N. on C.R.-----	271	381	479	446	Route 12. San Diego to El Centro				
E. on 10-----	551	587	473	520	District VII				
Oilfields at Oil King School, W. on 10-----	430	425	1,167	1,260	San Diego E. of Cy. Euclid Ave. at Cajon Ave.-----		Road closed	7,120	4,445
N. on C.R.-----	216	232	236	280	El Cajon W. of Cy. Lts.-----	6,267	4,093	5,124	3,812
E. on 10-----	215	200	925	982	At Sweetwater Bridge-----	1,552	626	2,053	1,362
Kings River Bridge-----	313	319	469	451	Jacumba at Jc. C.R. to El Campo, W. on 12-----	1,125	525	1,388	746
Lemoore Jc. C.R. to Lemoore, N. on 10-----	396	370	607	597	S. on C.R.-----	487	351	533	208
E. on C.R.-----	370	385	560	560	E. on 12-----	1,566	854	1,844	940
S. on 10-----	375	353	651	607	Route 12. District VIII				
*Construction under way from Junction to Greenwood Corner.					On Imp-12-B-----	1,117	614	1,288	727
					El Centro W. of Cy. at Jc. Rt. 26 to S. Bd., W. on 12-----	1,990	1,769	2,843	2,774
					N. on 26-----	2,240	2,477	3,299	3,600
					E. on Mulberry Lane-----	733	837	2,191	2,353
					S. from Interx.-----	3,133	3,302	4,040	4,117
					Route 13. Salida to Rt. 23 at Junction				
					District X				
					Salida Jct. Rt. 4, E. of Jct.-----	380	344	421	404

Station location	July, 1928		July, 1929		Station location	July, 1928		July, 1929	
	Sun. 15	Mon. 16	Sun. 14	Mon. 15		Sun. 15	Mon. 16	Sun. 14	Mon. 15
E. of Salida at Nellenry's Jc. C.R. to Modesto.....					Lakeport S. of town at Jc. C.R. to Kelseyville.....				
W. on 13.....	522	535	580	459	N. E. on 16.....	1,494	1,087	1,498	1,206
S. on C.R.....	2,159	1,945	2,117	1,572	S. on C.R.....	1,021	798	960	922
E. on 13.....	2,218	1,985	2,168	1,581	W. on 16.....	492	289	478	341
Oakdale W. of City.....	1,496	1,179	1,742	1,259					
Mountain Pass Jct. Rt. 40 to Yosemite.....					Route 17. Roseville to Nevada City				
S. W. on 13.....	750	566	1,204	632	District III				
S. E. on 40.....	411	214	819	220	Roseville E. of City.....	3,761	2,139	3,601	2,193
N. E. on 13.....	1,684	490	1,356	536	Auburn W. of Cy. Jct. Ophir Road & Wise P. H.,.....				
Sonora S. of City.....	2,201	1,740	2,434	1,618	E. on 17.....			1,955	1,803
Sonora E. of City.....	1,850	1,174	1,884	1,071	W. on 17.....			2,277	1,977
E. End of Sullivan Cr. Br.,.....			820	619	N. on C.R.....			312	290
E. on Br.....			1,086	473	Auburn S. of City at S. P. Xing.....	3,367	1,978	1,955	1,808
N. E. on 13.....			1,884	1,071	Auburn N. of Cy., S. on 17.....	1,479	796	637	375
W. over Br.....					E. on C.R.....	118	72	54	67
Jct. St. Highway & Rd. to Pine Cr.,.....					E. on 17.....	1,414	736	623	386
E. on 13.....			660	347	Grass Valley S. of City.....	1,405	678	1,282	631
W. on 13.....			540	273	Nevada City S. of City.....	1,599	1,236	1,909	1,309
S. E. on C.R.....			914	390					
Jct. St. Highway & C.R. at Pooleys,.....					Route 18. Merced to Rt. 40 near Sequoia				
W. on 13.....			1,612	578	District VI				
E. on 13.....			1,961	672	Merced 1.6 Mi. E. at Interx C.R. & 21st St.,.....				
S. on C.R.....			434	171	W. on 18.....	2,714	2,212	2,598	2,368
Rt. Confidence and Bakers Sta.,.....	796	217			E. on 18.....	2,664	2,326	2,661	2,448
					N. on C.R.....	1,037	768	1,469	1,419
Route 13. District IX					Merced 12 Mi. E. at Interx C.R. to Le Grand,.....				
Jct. Rt. 23.....	73	87	37	35	W. on 18.....	1,774	1,165	1,848	1,296
					S. on C.R.....	101	63	107	69
Route 14. Albany to Martinez					E. on 18.....	1,919	1,207	1,877	1,284
District IV					Mormon Bar at Int. with C.R. to Mormon Bar,.....				
Albany at Co. Line.....	21,947	13,830	26,028	15,802	S. on 18.....	2,418	1,463	2,239	1,435
Jct. C.R. to Richmond,.....					E. on C.R.....	543	257	368	254
S. on 14.....	20,958	13,217	25,420	14,008	N. on 18.....	2,407	1,501	2,026	1,328
W. on C.R.....	8,760	5,048	8,631	5,378	Briceburg at Bear Cr. Br. on 18.....	1,663	999	1,648	1,031
N. on 14.....	15,699	8,097	16,934	8,848	El Portal, Jct. Co. Rd. El Portal,.....				
Jct. Franklin Canyon Rd.,.....					W. on 18.....			1,850	1,211
S. on 14.....	10,741	5,089	11,276	5,192	E. on 18.....			1,819	1,257
E. on C.R.....	2,629	1,170	2,460	1,295	W. on C.R.....			381	387
E. on 14.....	8,782	4,172	9,156	4,273					
Crockett 1 Mi. S. of City at Jc. C.R. to Crockett,.....					Route 19. From Rt. 9 West of Claremont to Riverside				
S. on 14.....	2,031	1,342	2,107	1,529	District VIII				
W. on C.R.....	1,179	1,175	1,152	1,258	Bet. Pomona and Ontario at Chino Cross Roads,.....				
N. on 14.....	1,929	1,273	1,898	1,315	W. on 19.....	9,642	6,887	10,674	6,650
Martinez W. Cy. Lts.,.....	1,319	692	1,127	542	N. on C.R.....	179	253	98	147
Carquinez Straits Br.,.....	7,684	3,239	7,260	3,244	S. on C.R. to Chino.....	1,164	1,266	290	308
					E. on 19.....	9,965	6,837	10,546	6,828
Route 15. Rt. 1 near Calpella to Rt. 37 near Cisco					L. A. Co. Li. E. Lts. Pomona.....	10,677	7,071	11,733	7,546
District IV					East of Ontario E. City Lts. at Jc. of New S. Bd.-19-B with old road,.....				
Ukiah N. at Jc. Rt. 1.....	889	620	1,019	749	W. on 19.....			4,645	3,054
Upper Lake S. of Cy. Jc. C.R. to Lakeport,.....					W. on 19.....			1,090	691
W. on 15.....	766	688	1,198	1,181	Ontario Cy. Lts. N. W. on 19.....	3,563	2,398	3,873	2,274
S. on C.R.....	941	892	763	566	At S. Bd.-Riv. Co. Line.....	3,922	2,145	4,355	2,673
N. on 15.....	651	498	927	894	Wineville E. of City.....	4,646	2,649	4,312	2,421
Upper Lake Jc. C.R. to Bartlett Springs,.....					Riverside W. of Cy. near Santa Ana Riv. Br.,.....	6,554	5,500	13,305	5,098
W. on 15.....	327	269	404	349	Los Angeles Co. Line E. Cy. Lts. Pomona.....			2,534	2,159
E. on C.R.....	303	212	59	34					
S. on 15.....	48	51	377	329	Route 20. Rt. 1 near Arcata to Redding via Weaverville				
					District I				
Route 15. District III					Arcata N. of Cy. at Jc. Rt. 1.....	1,647	831	1,388	934
Hog Hollow Jct. Rts. 49 & 15,.....					Willow Creek Jct. C.R. to Hoopa,.....				
E. on 15.....	105	58	266	354	W. on 20.....	144	59	127	82
S. on 49.....	229	194	272	217	N. on C.R.....	151	84	135	76
N. on 15.....	165	90	379	443	E. on 20.....	107	71	169	87
Near Venada Jc. C.R. to Bartlett Springs,.....					Humboldt-Trinity Co. Line.....	180	121	186	86
S. on 15.....	120	90	103	97					
W. on C.R.....	95	53	72	66	Route 20. District II				
E. on 15.....	214	141	215	150	Big Bar vicinity.....	59	86	88	79
Williams W. of City.....	435	494	655	551	Weaverville 3 Mi. South.....	122	133	184	207
E. of City.....	458	431	539	477	Bet. Redding and Tower House.....	310	208	259	415
Colusa E. of City.....	802	673	900	760					
Sutter City,.....					Route 21. Rt. 3 Nr. Richvale to Quincy				
W. on 15.....	851	681	895	624	District III				
N. on C.R.....	258	226	309	217	Richvale Wye.....	388	318	449	358
E. on C.R.....	373	503	366	456	Oroville W. of Cy. at Jct. Marysville Rd.,.....				
S. on 15.....	1,019	899	1,045	806	N. on 21.....			1,790	1,722
Marysville E. of City.....	1,054	684	1,031	656	W. on 21.....			1,067	1,026
Smartsville E. of Cy., N. on 15.....	295	178	351	126	S. on C.R.....			827	598
W. on 15.....			362	130	Oroville E. of City.....	1,149	707	1,510	1,142
W. on C.R.....			85	52	Bidwell Bar Br.,.....	397	130	599	223
Grass Valley W. of City.....	575	322	727	410					
Nevada City E. of City, E on 15.....	314	245	427	347					
Route 16. Hopland to Lakeport									
District IV									
Hopland at Jc. Rt. 1.....	776	808	711	787					

Station location	July, 1928		July, 1929		Station location	July, 1928		July, 1929	
	Sun. 15	Mon. 16	Sun. 11	Mon. 15		Sun. 15	Mon. 16	Sun. 11	Mon. 15
Miners Ranch, N. on 21-----	654	176	837	245	Bet. San Andreas and Valley Springs-----	767	359	897	385
S. on C.R.-----	210	123	252	131	Jct. Rts. 24 & C.R. to Vallecita, E. on 21-----	590	312	653	285
W. on 21-----	828	274	1,008	362	S. on C.R.-----	168	81	175	117
Berry Creek-----	180	68	329	141	W. on 21-----	601	308	641	298
Meadow Valley, W. on 21-----	120	105	147	128	Jct. Rt. 21 & Co. Rd. to Murphys, S. on 24-----	533	293	654	289
N. on C.R.-----	51	73	100	111	N. on C.R.-----	421	195	485	292
E. on 21-----	78	56	179	141	E. on 24-----	732	329	852	377
Quincy-----	312	269	552	366					
Route 22. San Juan Bautista to Rt. 32 via Hollister									
District V					Route 25. Nevada City to Downville				
San Juan Bautista S. of City at Jct. Rt. 2-----	2,662	1,525	3,001	1,780	District III				
Route 22. District IV					Nevada Cy. N. of Cy.-----	382	246	418	225
Hollister Junction Jc. Rt. 32-----	1,130	614	1,065	699	Comptonville N. of Cy.-----	289	230	293	151
Route 23. Saugus to Rt. 11 at Alpine Jct.					Downville Jct. Rts. 25 & 36, W. on 25-----	127	121	251	146
District VII					N. on 36-----	9	9	10	7
Saugus Jc. with Rt. 4-----	4,733	2,669	3,896	2,403	E. on 25-----	166	112	261	149
Palmdale S. of Cy. Lts.-----	2,266	1,421	2,111	1,374	Route 26. San Bernardino to El Centro				
Lancaster Jc. with R. 59 to Neenach, S. on 23-----	1,596	1,363	1,913	1,542	District VIII				
W. on 59-----	636	616	690	581	San Bd. S. of Cy. at N. end of Santa Ana R. Br., N. on 26-----	2,504	2,200	Not taken	
N. on 23-----	1,224	1,012	1,361	982	W. on C.R.-----	3,422	2,422	Not taken	
L. A. Kern Co. Line-----	759	518	889	549	S. on 26-----	3,964	3,153	Not taken	
Route 28. District IX					Jct. Rd. to Colton at Interx with Mt. View Ave. W. of Redlands, E. on 26-----	3,494	2,077	4,741	3,344
Mojave Jct. Rts. 58 and 23, S. on 23-----	495	486	821	569	S. on C.R.-----	1,006	827	962	707
E. on 58-----	109	107	131	90	N. on C.R.-----	1,143	817	1,661	1,549
N. on 23-----	577	566	624	911	W. on 26-----	2,714	1,924	4,248	2,806
Mojave Jct. C.R. to Bakersfield, S. on 23-----	986	650	778	619	S. E. of Redlands Jc. C.R. to Yucaipa, N. W. on 26-----	2,245	1,630	2,773	2,115
N. W. on C.R.-----	623	410	303	292	E. on C.R.-----	433	512	588	535
N. on 23-----	530	349	478	363	S. E. on 26-----	1,749	1,258	2,224	1,634
Freeman 1 Mi. N. Jc. to Rt. 57, N. on 57-----	374	213	415	314	At S. Bd. Riv. Co. Line-----	1,872	1,223	2,386	1,756
N. on 57-----	62	28	87	62	Beaumont Jc. Jack Rabbit Trail, N. W. on 26-----	1,522	1,084	2,226	1,390
N. on 23-----	385	290	334	439	W. on Jack Rabbit Trail-----	858	526	1,147	670
Kern-Inyo Co. Line-----	450	230	435	305	E. on 26-----	2,150	1,479	3,051	1,945
Olancho Jct. C. Rd. to Keeler, S. on 23-----	225	160	524	347	Banning W. of Cy.-----	2,130	1,500	2,637	1,913
E. on C.R.-----	12	10	26	28	At Jc. with C.R. to Palm Springs, E. on 26-----	946	752	1,115	925
N. on 23-----	323	221	520	347	S. E. to Palm Springs-----	185	131	243	184
Lone Pine S. Cy. Lts. Jct. C. Rd. to Keeler, S. on 23-----	864	792	707	606	N. on 26-----	1,057	844	1,304	1,040
E. on C.R.-----	51	41	106	109	Coachella S. of Cy. at Jc. C.R. to Thermal & Mecca, N. on 26-----	1,128	1,301	1,088	1,059
N. on 23-----	909	833	750	637	E. on C.R.-----	697	751	538	547
Big Pine Jc. Rt. 63 to Oasis, S. on 23-----	993	648	855	586	W. on C.R.-----	173	357	185	182
E. on 63-----	68	90	67	70	S. on 26-----	706	945	777	701
N. on 23-----	992	610	817	554	At Riv.-Imp. Co. Line-----	608	667	861	766
Bishop $\frac{1}{2}$ Mi. N. at Jc. C.R. W. to Lawn & Dirt Rd. Easterly, S. on 23-----	1,338	1,069	1,314	1,088	Westmoreland at R. R. Xing-----	1,529	1,432	1,586	1,777
N. on C.R.-----	313	379	324	368	Brawley at E. Cy. Lts. Jct. with Western Ave., W. on 26-----	1,869	2,024	2,356	2,506
E. on C.R.-----	40	29	22	21	N. on Cy. St.-----	150	119	130	118
W. on 23-----	1,062	720	997	732	E. on Cy. St.-----	1,799	1,925	2,329	2,569
Leeving Jct. Rts. 40 & 23, on 40 on 23-----	157	216	208	197	S. on Cy. St.-----	227	189	167	141
on 23-----	410	335	379	387	Brawley Jc. S. W. of Cy., S. on 26-----	1,793	1,926	2,591	2,656
Mono-Inyo Co. Line-----	686	356	652	397	N. on Cy. St.-----	1,623	1,812	2,456	2,642
Mono 23-L-----	229	241	311	307	N. W. on C.R.-----	186	199	140	125
Bridgeport at E. Cy. Lts.-----	264	307	327	365	El Centro W. of Cy. Jc. Rt. 12-----	2,240	2,477	3,299	3,600
On Mono 23-K-----	263	291	177	122	Route 27. El Centro to Yuma				
Sonora Jct., Jct. Rts. 13 & 23, S. on 23-----	76	143	174	190	District VIII				
W. on 13-----	73	87	37	35	El Centro N. of Cy. at Jc. C.R. N. to Brawley & S. to Calexico, W. on 27-----	1,719	2,276	2,671	3,082
N. on 23-----	120	195	170	210	N. on C.R.-----	175	157	140	194
District X					S. on C.R.-----	181	171	152	185
S. of Markleeville Jct. Rt. 24, on 23 on 24-----	47	33	60	50	E. on 27-----	1,702	2,176	2,609	3,014
Picketts Jct., Jct. Rt. 34, E. on 23 W. on 34-----	153	116	86	63	E. of Holtville-----	1,102	1,504	1,616	1,621
N. W. on 23-----	128	84	90	26	Sand Hills Maint. Sta.-----	492	396	604	451
Jct. St. Hy. & Co. Rd. at Woodfords, S. E. on 23-----	121	117	78	38	Yuma at SDA Plant Quarantine Station-----	1,922	1,666	2,461	1,765
N. E. on C.R. to Minden-----			62	35	Route 28. Redding to Nevada Line via Alturas				
N. W. on 23-----			109	50	District II				
Route 24. Route 4 near Lodi to Route 23 near Silver Creek					Redding S. of Cy. at Jc. with Rt. 3 Montgomery Creek-----	527	567	665	654
District X					4 Mi. E. of Pittville at Maint. Sta. Canby-----	260	178	311	300
Lodi Jct. Rt. 4-----	1,543	1,180			112	98	182	122	
Jct. Rt. 24 & Co. Rd. to Ione, W. on 24-----	1,890	920	1,892	841	213	181	279	244	
N. on C.R.-----	1,060	369	1,024	392	5 Mi. N. Alturas at Jct. with Lakeview Rd., S. on 28-----			388	236
E. on 24-----	951	605	1,024	555	N. on C.R.-----			205	138
					E. on 23-----			219	121

Station location	July, 1928		July, 1929		Station location	July, 1928		July, 1929	
	Sun.	Mon.	Sun.	Mon.		Sun.	Mon.	Sun.	Mon.
12 Mi. E. of Alturas at Mtec. Sta.	134	78			Wasco Jct. Co. Rd. S. to Wasco				
East of Cedarville, 2 Mi.-----	63	57	121	58	near S. F. R. R. Xing,				
					W. on 33-----	345	324	632	586
					S. on C.R.-----	488	556	767	778
					E. on 33-----	470	480	824	712
					Famosa Jc. Rt. 4-----	268	211	670	524
Route 29. Red Bluff to Nevada Line Near Purdy's					Route 34. Route 4 near Arno to Route 23 at Picketts Jct.				
District II					District X				
Red Bluff E. at Jc. Rt. 3-----	652	599	849	573	Twin Cities Jc. Rt. 4-----	375	287	456	342
Teh.-Plu. Co. Line-----	283	208	468	293	W. of Lone Jc. C.R. to Michigan Bar,				
2 Mi. West of Westwood-----	981	603	1,272	729	W. on 34-----	161	57	179	92
Susanville 1 Mi. W. of town-----	1,130	584	1,206	662	N. on C.R.-----	127	98	136	132
Susanville 1 Mi. E. of town-----	1,236	1,082	1,589	1,362	E. on 34-----	298	165	305	237
12 Mi. E. of Milford at Main Sta.	181	153	293	191	W. of Jackson Jc. Rt. 65 to				
5 Mi. S. of Constantia at Main.					Placerville,				
Sta. -----	191	143	440	308	E. on 34-----	1,219	957	1,262	956
					N. on 65-----	853	813	875	815
					W. on 34-----	610	298	593	351
Route 31. San Bernardino to Nevada Line near Jean					Pine Grove E. of town-----	503	192	595	234
District VIII					Picketts Jc. Rt. 23 on 34-----	128	84	90	26
S. Bd. N. of Cy. at Jc. with Mt.					Route 35. Peanut to Kuntz				
Vernon and Highland Ave.,					District II				
S. on Mt. V.-----	2,987	2,156	2,968	2,022	At Peanut-----	91	39	72	48
E. on Highland-----	3,760	2,382	3,554	1,828	Route 37. Auburn to Nevada Line near Verdi				
W. on Highland-----	2,722	1,408	2,487	1,394	District III				
N. W. on 31-----	2,247	1,313	1,599	1,165	Auburn E. of City-----	2,276	1,425	2,147	1,348
Jct. Rt. 31 with State Street,					Colfax E. of Cy. Jct. Grass Valley				
N. W. on 31-----	2,782	1,541	2,061	1,158	Rd.,				
S. on State-----	703	247	710	285	W. on 37-----	1,774	1,006	953	441
S. W. on 31-----	2,018	1,208	1,420	1,000	N. on C.R.-----	298	177	283	168
Verdemont Jct. Rt. 31 and Kendall					E. on 37-----	1,683	929	779	439
Dr. C.R.,					Emigrant Gap Jct. Rts. 15 & 37,				
N. on 31-----			2,757	1,706	W. on 37-----	679	420	1,300	799
S. on 31-----			2,216	1,142	W. on 15-----	145	158	78	79
S. on K. Dr.-----			992	724	E. on 37-----	761	454	1,282	784
N. of Cajon Jc. C.R. to Swartout					Donner Lake Camp, W. on 37-----	923	873	1,266	1,121
Valley,					Truckee W. of Cy. Jc. with R.38 S.				
S. on 31-----	2,039	989	2,331	1,433	to Lake Tahoe,				
W. on C.R.-----	794	179	788	177	W. on 37-----	1,932	1,263	2,043	1,080
W. on 31-----	1,322	859	1,541	1,161	S. on 38-----	1,086	779	2,728	1,440
Victorville S. Cy. Lts.-----	1,400	1,069	1,865	1,455	E. on 37-----	2,747	1,733	2,634	1,353
Helendale-----	749	593	901	811	Truckee E. of Cy. at Jc. with Rt.				
S. town limits of Barstow-----	822	676	934	832	38 to Nevada Line,				
Yermo, E. of Cy. Lts.-----	301	210	486	477	W. on 37-----	1,533	863	2,650	1,408
Baker-----	193	160	311	301	E. on 38-----	1,384	595	2,188	1,030
Nevada State Line-----	212	234	277	239	E. on 37-----	364	308	456	291
Route 32. Route 2 near Gilroy to Route 4 near Califa					Route 38. Myers to Nevada Line via Truckee River				
District IV					District III				
Hollister Jc. with Rt. 22, W. cn 32	1,217	653	991	724	Myers Jct. route 11,				
S. on 22-----	1,130	614	1,065	699	N. on 38-----	301	217	497	292
E. on 32-----	2,014	1,142	1,639	1,291	Tahoe City at Jc. Rt. 39,				
Pacheco Pass at Santa Clara-Merced					S. on 38-----	3,213	1,693	3,003	2,407
Co. Line-----	1,809	998	1,783	1,042	E. on 39-----	3,401	1,485	2,510	2,236
					N. on 38-----	2,452	1,077	1,982	1,306
Route 32. District VI					Truckee W. of Cy. Jc. R. 37-----	1,086	779	2,728	1,440
Junction—Jct. C.R. to Gustine,					Truckee E. of Cy. Jct. with R. 37	1,384	595	2,188	1,030
W. on 32-----	1,761	984	1,782	1,090	Calif.-Nev. State Line-----	1,818	851	3,428	982
N. on C.R.-----	515	209	485	252					
E. on 32-----	1,398	821	1,522	903	Route 39. Tahoe City to Nevada State Line				
Los Banos, S. P. R. R. Xing					District III				
Near Maint. Yard-----			2,535	2,373	Tahoe City Jc. Rt. 38-----	3,401	1,485	719	396
E. of Los Banos at Jc. C.R. to					Near Brockway Jc. C.R. to Truckee,				
Dos Palos,					on 39-----	411	367		
W. on 32-----	1,737	1,469	2,224	1,808	State Line-----			719	316
S. on C.R.-----	724	627	910	852					
E. on 32-----	1,650	1,182	2,145	1,530	Route 40. Route 13 near Montezuma to Route 23 near Mono Lake				
Merced-Madera Co. Line at Jc. C.R.,					District X				
W. on 32-----	1,661	1,281	1,895	1,153	Mt. Pass Jc. Rt. 13-----	411	214	819	220
N. on C.R.-----	754	583	701	528	1 Mi. E. of Groveland, on 40-----	273	224	883	200
E. on 32-----	1,032	814	1,387	778	Aspen Valley Checking Station,				
Califa Jc. Rt. 4-----	870	695	1,142	818	on 40-----	198	199		
					Gentry, Checking Station, on 40-----	146	130		
					Mono 40 A. Jct. with Mno-23-H-----	157	216	208	197
Route 33. Paso Robles to Route 4 near Bakersfield					Route 41. District VI				
District V					W. of Hume-----	83	35	199	141
Paso Robles E. of Cy. Lts.-----	1,297	1,317	1,184	1,332	E. of Hume-----	27	28		
Paso Robles $\frac{1}{4}$ Mi. E. of Cy. Lts.					Route 42. District IV				
on 33-----	888	901	1,017	944	Saratoga Gap at Redwood Park				
Route 33. District VI					Gate -----	*64	*45	1,228	299
S. L. O.-Ker. Co. Line-----	439	256	483	269					
Blackwell's Cor. Jc. C.R. to Coalinga									
and S. to Taft,									
W. on 33-----	321	211	408	334					
N. on C.R.-----	25	21	162	303					
S. on C.R.-----	93	60	180	257					
E. on 33-----	263	172	400	379					
Lost Hills Intersection of Main St.,									
W. on 33-----	411	393	605	642					
N. on Main-----	24	29	31	34					
S. on Main-----	86	95	128	139					
E. on 33-----	399	402	605	603					

* Skyline Blvd. under construction.

Route 43. San Bernardino to Big Bear Lake

District VIII

Station location	July, 1928		July, 1929	
	Sun. 15	Mon. 16	Sun. 14	Mon. 15
Foot of Waterman Grade.....	2,957	831	3,828	1,037
Pinecrest Jc. C.R. to Lake Arrowhead.				
S. W. on 43.....	2,202	517	3,175	725
N. E. on C.R.....	2,136	472	3,633	667
N. W. on C.R.....	263	105	216	82
E. on 43.....	205	101	216	73
Running Springs Park Jct. Cy. Creek Rd.				
N. on 43.....	437	178	639	138
W. on Cy. Cr. Rd.....	1,303	411	938	359
E. on 43.....	1,626	563	1,488	477
W. end of Br. over Big Bear Dam.				
W. on 43.....	1,561	587	1,454	592
E. over Dam.....	1,528	677	1,458	610
N. E. on 43.....	1,040	458	784	378
1 Mi. from end of Rt. 43 Jct. C.R. to Pineknut.				
W. on 43.....	366	189	296	201
S. on C.R.....	446	238	149	112
E. on 43.....	570	325	325	212

Mill Creek Lower Control, S. Bd. Co.

Jct. Big Meadows, S. to Redlands	402	130	409	141
E. to Big Meadows.....	230	58	229	53
N. to Big Bear Lake.....	187	86	207	106

Big Bear Lake Desert Route

Jct. E. of Baldwin Lake, N. to Desert	152	56	141	61
W. to Big Bear Lake.....	143	54	121	51
S. on E. side of Baldwin Lake	59	19	34	10

Route 44. Boulder Creek to Redwood Park

District IV

Boulder Creek at Park Line.....	2,126	1,259	2,311	1,326
---------------------------------	-------	-------	-------	-------

Route 45. Willows to Rt. 3 N. of Biggs

District III

Willows, E. of City.....	631	706	634	742
Butte Cy. W. of Cy., N. on 45.....	382	361	344	333
N. on C.R.....	148	183	180	125
S. on C.R.....	486	423	510	509
E. on 45.....	390	458	513	508
Butte Cy., 3 mi. E. of Jct. Chico Rd.				
E. on 45.....			107	94
W. on 45.....			257	242
N. on C.R.....			163	95
S. on C.R.....			47	98
Cherokee Canal Jct. with C.R. to Richvale.				
W. on 45.....	46	62	104	82
N. on C.R.....	61	92	113	122
E. on 45.....	63	70	88	97

Route 46. Route 1 near Klamath River to Route 3 near Gray

District II

Weitchpec Jc. Co. Rds.....	48	56	54	51
Thompson Creek.....	68	64	45	58
Gray N. of Cy. Jct. Rt. 3.....	405	208	348	202

Route 47. Orland to Chico

District III

Orland E. of City.....			842	665
Gianelli Bridge on 47.....			947	529
Chico W. of City, W. on 47.....	1,326	1,151	1,408	1,130
S. on C.R.....	431	453	679	620
N. on C.R.....	122	196	378	408
E. on 47.....	1,589	1,423	1,877	1,634

Route 48. Near McDonalds to mouth of Navarro River

District IV

McDonald Jct. Rt. 1.....	275	316	432	278
Boonville, on 48.....	524	491	649	446
Navarro, 2.3 miles W. of town.....	427	359	514	346

Route 49. Calistoga to Lower Lake

District IV

N. of Calistoga at foot of grade.....	1,320	526	1,459	610
Middleton Jct. Cobb Mt. Rd., N. on 49.....	1,263	691	1,350	877
S. on 49.....	781	364	1,857	1,182
W. on CMR.....	1,967	1,071	660	448
Lower Lake Jc. Kelseyville & Lower Lake Road.				
S. on 49.....	640	431	884	431
E. on LLR.....	938	720	1,232	774
W. on K. Rd.....	414	334	531	393

Route 51. Santa Rosa to Schellville

District IV

Station location	July, 1928		July, 1929	
	Sun. 15	Mon. 16	Sun. 14	Mon. 15
Santa Rosa E. of City.....	4,160	2,458	4,248	2,420
8 Mi. E. of Santa Rosa at Sonoma Cr. Br.	2,873	1,161	1,608	2,546
Schellville Jct., Rt. 8.....	2,487	878	3,266	1,012

Route 52. Alto to Tiburon

District IV

Belvedere Jct., Rt. 1.....	2,295	1,060	2,035	1,109
Richmond to San Rafael Ferry.....	No count			

Route 53. Fairfield to Lodi via Rio Vista

District X

Denverton at Overhead Xing.....	671	370	537	371
Rio Vista at Bridge, N. on 53.....			1,475	1,096
W. Br.....	1,565	1,177	2,206	1,374
S. on C.R.....			1,453	918
Walnut Grove at Bridge, W.....			1,968	1,484
E. on 53.....			1,836	1,298
S. over Br.....	518	391	547	423
West of Canneries near Isleton.....	3,028	2,164		
East End of Isleton Br., W. over Br.			2,218	1,760
N. on 53.....			386	333
S. on 53.....			2,447	1,932
Thornton Intersection C. Rd., E. on 53.....	1,549	1,109		
N. on C.R.....	762	619		
W. on 53.....	1,247	782		
Jct. St. Hy. & Co. Rd., E. on 53.....			1,305	911
W. on 53.....			1,081	749
N. on C.R.....			545	402
Lodi N. of City.....	1,258	1,101	1,341	1,303

Route 54. Near Michigan Bar to Central House

District X

Central House Jct. Rt. 65 to Placerville & Jackson				
W. on 54.....	284	111	650	273
N. on 65.....	322	154	541	349
S. on 65.....	263	133	594	318

Route 55. San Francisco to Route 5 near Glenwood

District IV

Swimming Pool.....	9,341	2,486	17,308	5,275
Jct. with C.R. to Colma, N. on 55	5,718	1,034	9,725	1,825
E. on C.R.....	2,414	680	3,727	987
S. on 55.....	6,019	1,298	11,105	1,887
Jc. C.R. to Belmont at Dirt Dam, N. on 55.....	3,814	580	5,795	834
SE. to Belmont.....	2,488	415	2,709	456
W. to Half Moon Bay.....	4,225	708	5,660	898
Jct. Rt. 55 with Co. Rd. W. to Half Moon Bay.				
N. on 55.....			5,408	831
S. on 55.....			2,187	255
W. on C.R. to Half Moon Bay			3,395	611
S.Cl.-S.Cr. Co. Line between Saratoga Gap and Route 5.....	63	27	32	9
S.Cl.-S.Cr. Co. Line Jct. Rt. 5 & 55.....	32	16	166	39

Route 56. District V

S. of Carmel Interx of Carmel Valley and Big Sur Roads.....	1,575	944	1,972	1,104
San Simeon 1 mile S.....	240	183	296	163

Route 57. Santa Maria to Freeman via Bakersfield

District V

Santa Maria N. of Cy. at Jc., Rt. 2.....	203	96	244	168
At Interx Rt. 57 & Suey Rd., S. on C.R.....	185	122	159	69
E. on 57.....	327	134	340	123
Cuyama Lateral between 2d Cuyama Xing & Kern Co. Line, W. on 57.....	182	50	213	96
E. on 57.....	173	53	199	81

Route 57. District VI

SLO—Ker. Co. Line.....	276	87	277	147
Maricopa W. of Cy.....	535	353	506	338
Pentland at RR Xing.....	383	393	636	773
Bakersfield Jct. Co. Rd. N. to Connor.				
W. on 57.....	129	130	193	169
N. on C.R.....	43	60	79	80
E. on 57.....	89	75	131	92
Jct. Rt. 4.....	90	85	147	97

Station location	July, 1928		July, 1929	
	Sun. 15	Mon. 16	Sun. 14	Mon. 15
Bakersfield E. Nile & School house				
Easterly Cy. Lts.-----	2,116	1,922	2,370	2,089
Bakersfield 10 Mi. E. at Jct. Co.				
Club Rd. & Ker.-57-E. on 57.-----	1,098	192	1,005	471
Bodfish at IntX Rt. 57 with Cr. to Caliente.				
E. on 57-----	279	113	270	147
S. on 57-----	230	97	238	138
S. on C.R.-----	52	24	66	37

Route 58. Mojave to Arizona Line near Topoc via Barstow				
District IX				
Mojave -----	109	107	131	90

Route 58. District VIII				
Kramer Kern Co. Line-----	73	69	84	73
Barstow N. of Cy. at Jc. C.R.,				
S. on 58-----	333	276	376	297
W. on 58-----	199	175	225	172
N. on C.R.-----	136	95	169	152
Barstow Jct. Rd. E. to Standard				
Oil Station Back of Harvey				
House, N.-----	446	385	418	454
E.-----	1,066	978	531	551
W.-----	75	88	88	171
Daggett Jc. Arrowhead Trail, Old				
Trails Hgwy.,				
N.-----	346	291	377	410
W.-----	756	611	826	681
E.-----	539	423	570	471
Vicinity Newberry Sprgs.-----	405	334	535	495
Vicinity Amboy-----	303	270	373	376
Near Bannock Jc. C.R. to Search-				
light.				
W. on 58-----	283	224	294	283
N. on C.R.-----	22	19	23	19
E. on 58-----	194	237	303	299
Needles W. of Cy. Lts.-----	611	471	646	541
Needles 5.7 Mi. S. Jc. to Parker				
and Blythe.				
S. on 58-----	294	263	429	414
SW. on C.R.-----	10	41	11	26
N. on 58-----	310	264	410	435

Route 59. Lancaster to Baileys				
District VII				
Lancaster Jct. Rt. 23-----	636	616	690	584
Bailey Ranch-----	107	92	89	84

Route 60. El Rio to San Juan Capistrano				
District VII				
Santa Monica Interx Beverly & L.				
A. 60-B Santa Ynez Can-				
yon.				
W. on 60-----	25,553	6,294	28,635	11,109
on Bev. Blvd-----	no count		16,611	3,317
E. on 60-----	29,517	8,547	53,303	22,402
Lomita on Redondo-Wilmington				
Rd., on 60. E. of Walnut-----	10,261	6,842	13,034	8,161
Seal Beach at L. A.-Orange Co.				
line-----	20,786	8,516	24,332	10,394
Newport N. of Cy.-----	14,759	4,480	16,740	6,040
Newport at Interx Newport-Tustin				
Road,				
N. on C.R.-----	10,112	3,645	16,645	7,251
E. on 60-----	13,113	5,545	15,710	6,120
W. on 60-----	12,243	5,311	11,089	4,054
S. on C.R.-----	13,338	5,377	14,104	6,004
At Santa Monica Canyon and L.				
A. 60-B, on Santa M. Canyon				
Road-----			25,577	9,876
At Topanga Canyon & L. A.-60B				
on Topanga C. Rd.-----			25,152	12,038
At Oxnard S. of City Limits, on				
Ven. 60-A-----			9,821	3,758
Santa Monica, Interx Beverly				
Bldv. and L. A.-60B., Santa				
Ynez Canyon, E. on 60-----	Sun., June 30 & Thur., July 1		21,433	26,631
Malibu Ranch at Trancas Creek,				
L. A. 60-A, Sta. 420-----	July 4, 1929		24,525	

Route 61. La Canada to Mt. Wilson Rd. via Arroyo Seco				
District VII				
Pasadena at N. Cy. Lts.-----	2,334	468	2,557	602

Route 63. Big Pine to Oasis. District IX				
Big Pine Jct. Rt. 23-----	68	90	67	70

Route 64. Mecca to Blythe. District VIII				
Station location	July, 1928		July, 1929	
	Sun. 15	Mon. 16	Sun. 14	Mon. 15
Desert Center-----	84	58	84	81
Blythe S. D. A. Quarantine Sta.-----	157	119	88	68

Route 65. Auburn to Sonora. District III				
Auburn at Wire Bridge, American				
River,				
N. on 65-----	264	137	262	116
E. on C.R.-----	131	52	189	66
S. on 65-----	120	85	344	118
Placerville N. of Cy. Jct. George-				
town Road.				
N. on 65-----	198	128	226	177
N. on C.R.-----	48	44	161	117
S. on 65-----	185	134	292	192
El Dorado S. of City-----	260	103		

Route 65. District X				
Central House Jct. Rt. 54 to				
Michigan Bar,				
N. on 65-----	528	408	541	349
W. on 54-----	518	282	650	273
S. on 65-----	447	375	594	318
N. of Jackson Jct. Rt. 34, N. on 65	853	813	875	815
E. on 34-----	1,219	957	1,262	956
S. on 34-----	610	298	593	351
S. of San Andreas at Sheep Camp	964	641	1,171	624
W. of Sonora, Jct. C.R. to				
Jamestown,				
NW. on 65-----	291	228	343	376
SW. on C.R.-----	176	156	368	194
SE. on 65-----	268	213	155	348

Route 66. Manteca to Rt. 5 nr. Mossdale School—District X				
Mossdale Jct. Rt. 5-----	5,350	3,671	3,611	2,128

Route 67. Pajaro River to Rt. 2 nr. San Benito River Bridge				
District V				
San Juan Bautista, N. of City at				
Jct. Route 2-----	3,390	1,480	3,697	1,533

Route 68. San Francisco to San Jose				
District IV				
San Bruno Jct. with Rt. 2 to San				
Francisco-----	3,685	2,581	2,185	1,912
N. City Limits S. S. F.-----	10,006	5,872	7,380	5,369
So. San Francisco at underpass-----	10,097	4,321	10,434	4,840
Burlingame, Jct. 68 with Broad-				
way, Burlingame,				
N. on 68-----			10,268	4,776
S. on 68-----			9,261	3,613
W. on Bldwy.-----			2,596	2,060

Route 69. San Quentin Road. District IV				
San Quentin Hill-----	4,450	1,743	4,904	2,333

Route 70. Ukiah to Men. State Hospital				
District IV				
Ukiah Jct. Route 1-----	873	960	1,061	1,006

Route 71. Crescent City to Oregon Line. District I				
Crescent City N. of town at Maint.				
Yard-----	902	872	1,053	1,087
At Oregon line-----	318	257	462	409

HOW TIMES HAVE CHANGED

(From the Twenty-five Years Ago Column of the San Francisco Chronicle.)

June 6, 1923—A. H. Pilenburg took the breath of California motorists by making a run from San Diego to San Francisco, a clocked distance of 750 miles over the then existing roads, in six and one-half days. The previous record had been eight days.

Farmer Brown drove his flivver into town one day and left it in the public square.

"Here," yelled a policeman, "you can't park your car there."

"What you got the sign up there for? Don't it say 'Place for Parking Automobiles?'"

STATE OF CALIFORNIA

Department of Public Works

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Eleventh and P Streets, Sacramento, California

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Patrol

DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief

DIVISION OF PORTS

Port of Eureka—F. B. Barnum, Supervisor

Port of San Jose—Not appointed

Port of San Diego—Edgar A. Luce

STATE HIGHWAYS IN CALIFORNIA SHOWING THE PRIMARY AND SECONDARY ROAD SYSTEMS AND THE DIVISION OF THE STATE UNDER THE BREED BILL.



California Highways and Public Works



Main Entrance to State Teachers College at San Diego

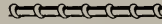
Official Journal of the Department of Public Works
State of California

OCTOBER

1929



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Building Roads Under Budget Plan Has Materially Reduced Overhead Costs

By C. H. PURCELL, State Highway Engineer

IN AN engineering organization such as the Division of Highways, the ratio of expenditures for overhead to total expenditures depends greatly upon the extent to which work can be planned in advance. The present system of financing highway expenditures in California lends itself to an orderly planning of the work as revenue becomes available at frequent intervals and in amounts that can be closely estimated in advance.

In financing highway activities from bond issues, there is the disadvantage that a large amount of money becomes available at one time without any definite plans as to its expenditure. It then becomes necessary to build up a large organization, and to conduct such surveys and studies as are necessary to plan the expenditure of the funds available. As the bond fund becomes depleted, the need for such a large organization decreases, but as it is difficult to break down such an organization rapidly, a high overhead percentage will result, and the organization will lose many of its valuable employees. When another bond issue is passed, all of the work of building up the organization must be repeated and at a considerable expense to the overhead ratio.

Financing highway expenditures from current continuous revenues permits the building of an organization which can be held down to a point where it is employed at its maximum capacity in carefully planning and supervising the expenditure of the funds available. This department now prepares a complete detailed budget for two years in advance which, when approved by the California Highway Commission, the Director of Public

Works, and the legislature, becomes the official program for the biennium. The State Highway Engineer can then concentrate the entire organization upon the systematic prosecution of this program, taking into consideration seasonal and regional conditions with the object of obtaining the utmost efficiency. In the meantime, plans and studies are going ahead in the development of a budget for the next two-year period.

An important advantage of the two-year budget plan is that when the State Highway

Engineer has developed a budgeted project to the point where it is ready to be undertaken, no unnecessary delay is involved as the project already has the approval of the California Highway Commission, and with the approval of the Director of Public Works, a contract can be entered into forthwith.

Our overhead ratio is showing the effect of this system of planning. At the beginning of the biennium just passed, we were confronted with the budgeting and expenditure of the new revenue available from the one-cent

gasoline tax, which for the biennium amounted to over \$16,000,000. Consequently, the greater part of the first year was spent in adjusting the organization to the increased activity resulting from this additional revenue, and the increased revenue from the two-cent gasoline tax. In spite of that fact, the ratio of overhead to total expenditures for the biennium was 4.43 per cent as compared to 4.85 per cent, which has been the average overhead ratio since the inception of the organization in 1912. The percentage for June was 3.46 per cent, and for July 3.16 per

OVERHEAD COSTS ARE LOWEST IN HISTORY OF STATE HIGHWAY SYSTEM

The state highway overhead percentage is now at the lowest point since the inception of the state highway organization in 1910.

The average overhead expense since the inception of the organization has been 4.85 per cent. During the biennial period beginning July 1, 1927, and ending June 30, 1929, the overhead costs were reduced from 5.38 per cent at the beginning of the biennium to 3.46 per cent at its close.

The Division of Highways is endeavoring to still further reduce this overhead cost, and confidently expects to do so during the current biennium.

The amount added to project costs for contingencies has been cut from 12 per cent to 5 per cent during the past biennium.

The Growth of Motoring In California

By MARSHALL A. PAGE, Chief Clerk of the Division of Motor Vehicles

CALIFORNIA is truly a state on wheels and the oft-repeated statement that it is the "motoring ground of the nation" is no idle boast.

But to the staff of the Division of Motor Vehicles as to no others has the amazing growth of the use of the motor vehicle in the state been a constant source of wonder. Five years ago it was predicted confidently that the "saturation point" had been reached. But five years has seen an increase of nearly a million vehicles, and there seems to be no end.

MAY LEAD NATION

Today we lead every state in the Union in numbers with the exception of New York and it is possible that the end of the current year may find us even ahead of the Empire state.



An ocean view in Orange County on the Coast Highway.

Figured on a per capita basis, we are far ahead of any other state. Our records as of June 30th last show a total fee paid registration of 1,859,523. This, divided into the mid-year estimate of the State Bureau of Vital Statistics of 4,456,659 population for the state, gives us one car for approximately every 2.4 persons in California.

Excluding every type of vehicle with the exception of pleasure or passenger cars, the mid-year figure, which is 1,737,961, gives us one car for approximately every 2.6 persons. The nearest approach to this is our next door neighbor, Nevada, with one car for every 2.8 persons. New York, our old rival from



Mt. Shasta inspires the motorists along this highway.

point of numbers, is far down the list with 5.5 persons for every car.

ALL COULD "JOY RIDE"

Indeed if we were to add all the motorcycles, dealers' cars and the exempt vehicles used by the state, cities, counties and other political subdivisions and by public utility corporations, it is safe to say we would have close to one vehicle for every two persons in California.

Our passenger cars alone could take the entire population of California "joy riding" and there would be room to take along the populations of Arizona, New Mexico, Nevada, Wyoming and possibly Idaho as our guests.



Oranges and palms adorn this southern California road.

More romantic even than the story of the ill-fated and short-lived "pony express" or the rumbling "Conestoga" wagons that blazed the trails in the American wilderness of the west is the story of this amazing growth of motoring in California.

THE FIRST REGISTRATION

It was on May 5, 1905, barely twenty years after Gottlieb Daimler's invention of the internal combustion motor that was to revolutionize the world of transportation, that motor vehicle history began officially in California. On that date the first car, a White steamer, was registered by Charles F. Curry, then the Secretary of State. The registrant was John D. Spreckels, well known California capitalist. He paid \$2 as his fee and was assigned a number.



The Kern River Canyon offers unique views to the motorist.



The motorist travels this causeway as he approaches the redwood country.

At that early date there were only about 80,000 such vehicles in the entire world. Inventors were still struggling with the idea that the steam locomotive could be evolved into a practical carriage for individual use. Steam bicycles were still the dream of many and many others were wrestling with the problem of flying, a field of endeavor that had intrigued the mind of men long before locomotives or motor vehicles were thought of.

SIGNS OF PROGRESS

In less than two years after Mr. Spreckels registered his vehicle more than 10,000 had been registered. The cars of that era were not the beautiful creations with their luxurious appointments and numerous devices for comfort and safety of our day. For the most part they were of the chugging, one-cylinder type and the duster and goggles were an indispensable part of the motorist's equipment.

Two or three of these old-timers are still in our records, having apparently weathered the vicissitudes of time. The greater part of them, however, have long since found their way to the inevitable junk yard.

By 1915, registrations had leaped to 163,795 and motoring was no longer the sport of the foolhardy. It had become an integral part of the community life of California. Realizing that motoring had grown to such proportions as to make registrations a burden on any existing state department, the legislature passed a bill introduced by Senator E. S. Birdsall of Auburn providing for a motor vehicle department to have exclusive charge of all such records. H. A. French was selected by Governor Hiram W. Johnson as the first chief of the department.

REGISTRATIONS KEEP GAINING

The World War did not retard the growth of motoring but apparently stimulated it.



Motoring among the blossoms of Santa Clara County's orchards.

Registrations leaped to 232,440 in 1916, to 306,916 in 1917, to 364,800 in 1918 and to 477,450 in 1919. The million mark was passed in 1923.

A glance at world motor vehicle statistics will show California has forged far ahead of every other part of the globe in motor ownership. Latest figures of the automotive division of the federal bureau of foreign and domestic commerce show a total of 31,778,203 motor vehicles in the world. Seventy-seven per cent, or 24,493,124 of these, are in the United States. And of those in the United States approximately 2,000,000, or about 8 per cent, are in California.

MANY FACTORS

Many factors are responsible for this phenomenal growth. First of all there is California's matchless climate, a constant lure



The highway along historic Donner Lake is filled with interest.

to its population to get out of doors. In the east the motor owner puts his car in the garage along about the middle of November, jacks up the wheels, fills the radiator with an anti-freezing solution and keeps it there until the first of April.

Not so in California. Aside from its commercial uses, the family car gets just as much service in winter as in summer. Picnic parties may be found along any California highway in December or January on week-end days. The roads leading to the "snow line" of the Sierra are crowded throughout the winter with motorists who drive in an hour or two from sun-bathed valleys to snow-crested mountain tops.

In summer almost everybody "goes on vacation" in California. That means either a trip to the mountains or to the seashore.

Either can be reached in three or four hours at most.

LESS DEPRECIATION

California is a lucrative field for the automobile dealer because cars are used more and wear out faster as a consequence. Depreciation, the bugbear of motor finance, is not the factor in California it is in other states because the car is used constantly.

That the joys of motoring in California are being appreciated by residents of other states is evidenced by the increasing number of out-of-state cars we register each year. Last year we issued nonresident permits for 83,506 cars and there were thousands of others that entered the state for short periods that were not registered. Up to August 31st, this year, we had issued 50,917 permits.

LIBERAL POLICY

California has a very liberal policy in connection with the out-of-state motorist. He is permitted to remain here six months before he is required to take out a California license. Under the new law if his six-month permit expires in December he is not required to take out the new license until January, an arrangement which relieves him from paying a double fee.

Something of the amazing use of the motor vehicle is obtained from the report of the State Board of Equalization showing total gasoline consumption in California of 1,101,403,169 gallons for 1928 and 595,288,172 gallons for the first six months of 1929. Taking 15 miles a gallon as an average would give a total of 16,521,047,535 motor miles for 1928 and 8,929,322,580 for the first half of the current year.

(Continued on page 23.)

I AM THE HIGHWAY

I am the highway! O'er my polished floors
Is found the way to verdant things outdoors;
I am the path that circles peaceful grange
O'er tempting hill and towering mountain range:
I am the way to neighbor's yon abode
Where interchange of thought might ease a load,
Or lighten heart, or free a pinioned mind
From all the shackles that enchain mankind.

I am the highway! Over yonder hill
Where lilts the brook and sings the whippoorwill
Dame Fortune might entrance you with her wile
Or yet enrichen with her golden smile.
Who fares my fashioned path shall keep the pace
That Progress sets in vanguard of the race,
And, daring Fate, restraining cares and fears,
Rides on in triumph with the Pioneers.

Platt Young in *Georgia Highways Magazine*.

His Job Is To See That Dams Are Safe

TO CARRY OUT the provisions of chapter 766 of the Statutes of 1929, Mr. George W. Hawley of Berkeley has been appointed deputy in charge of dams to administer, under the direction of the State Engineer, the recent legislative enactment which places the supervision of all dams, other than federal dams, within the State of California, under the jurisdiction of the Department of Public Works.

The legislation provided in this act is the most complete and authoritative legislation relating to the supervision of dams enacted by any governmental agency. It provides for inspection, examination and approval of dams already constructed, makes mandatory the approval by state authority of the plans and specifications of any dam to be built, prior to the beginning of construction, grants the State Engineer authority to supervise enlargements, additions, modifications or repairs to existing dams and provides for the supervision of the maintenance and operation of dams in so far as is necessary to safeguard life and property.

Mr. Hawley has had wide experience in the engineering design and construction of dams. Since his graduation from Stanford University in 1913 he has been almost continuously employed in the engineering of storage projects.

Following his first employment Mr. Hawley served in the capacity of inspector, superintendent of construction, and later construction engineer for the South San Joaquin Irrigation District. During this period of employment, Mr. Hawley was in charge of the preparations of the foundations for and the construction of the Woodward dam, supply tunnel and reservoir control. He was then engineer in charge of construction on the San Pablo project of the East Bay Water Company. This project involved heavy foundation, dam and tunnel construction, the cost of which was about \$3,500,000. He also served as engineer in charge of construction for the Upper San Leandro project of the same company. This project involved the construction of a high dam and the necessary tunnel diversion and control works. The cost of this project was about \$2,500,000. While in the employ of the water company he was engineer in charge of the engineering investigation for an additional water supply for the



GEORGE W. HAWLEY.

East Bay municipalities. This investigation included an examination and engineering study of the many available sources of water supply and the engineering structures necessary to develop a 200,000 m.g.d. water supply.

Mr. Hawley served as engineer on a water storage project for the irrigation of about 100,000 acres of land in the Davis-Dixon-Woodland area. He was employed as consulting engineer for the Port Costa Water Company, reporting upon the necessary diversion, storage and treatment works to make the Sacramento River waters available for domestic and industrial uses in the north bay area. He has also acted as consulting engineer for the El Dorado Irrigation District, reporting upon the development of a storage project for that district, and has also advised on numerous other special engineering investigations.

While employed as engineer in charge of water supply investigations and construction

for the East Bay Water Company, Mr. Hawley was afforded the opportunity and privilege of visiting a large number of the storage works in California and spent about a two-month period visiting storage works throughout the United States.

Mr. Hawley is a member of the American Society of Civil Engineers and of the American Water Works Association. The announcement by Governor Young of his appointment immediately met with the hearty approval of the engineering profession at large.

The act which Mr. Hawley will administer is a composite act embodying the salient features of the many drafts presented by individuals, engineering groups, municipalities, irrigation districts, power companies, legislative bodies, other states and outstanding legal authorities. The tentative drafts submitted were seriously and conscientiously analyzed and studied and many conferences held to properly and logically discuss the ramifications of the proposals and to reconcile the outstanding or major differences of opinion.

The pertinent and outstanding provisions of these tentative drafts were incorporated in the present act, thus assuring the people of California that every effort humanly possible has been exerted to provide legislation adequate to thoroughly safeguard life and property. The act fully meets with the approval of all parties who are vitally interested, and it is in accord with sound engineering, financial and economic principles. The administration of the act is vested in the Department of Public Works, to be administered by the State Engineer. A satisfactory and successful functioning of the act in accordance with its intent is in a large measure dependent upon the aggressive, judicious and reasonable enforcement of the provisions of the act in accordance with sound engineering practice and judgment.

Commenting upon Mr. Hawley's appointment, Governor Young said:

"The organic act of the state, designated as chapter 766 of the Statutes of 1929, is an act providing for the supervision of dams by the Department of Public Works through the State Engineer for the purpose of safeguarding life and property. The act defines the powers and duties concerning the supervision of dams, provides for the enforcement of said supervision, provides penalties for violation thereof and makes an appropriation for carrying out the provisions of the act. The 1929 legislature, cognizant of the imperative need of conferring authority and responsibility for the supervision of dams as to their safety

Alturas Banquet Has Novel Menu

The following menu, written by John P. Callaghan, realtor of Alturas, appeared in a souvenir program at a banquet tendered members of the California Highway Commission and members of their party at Alturas on October 4th:

MENU

SOUP

Consomme is easily removed from the vest or linen but nobody seems to be crazy about it. Regular soup, such as cream tomato, has high visibility on vest and linen, but then it makes extra dishes to wash and what with folks being careless about soup spoons, and the like, there will be no soup. Not tonight.

SHRIMP COCKTAIL

FRUIT SALAD

The above are recommended by the Committee as highly nutritious! Made entirely from products grown in Alturas and vicinity, except the shrimp cans.

VENISON STEAKS CHICKEN A LA KING

When you have surrounded your choice of either or both of the above entries you will agree with the Committee that the rest of the line-up until you hit the apple pie a la mode isn't worth a damn except as scenery, so in order to save printing costs we aren't even going to set them down here, except to say that it is the usual stuff like pickles, olives, mustard and etc. But don't forget to give that apple pie a heavy play—it is the national dish of Modoc.

Now that dinner has been served and eaten, it may be told. It was intended primarily (!) to supply each guest with a ten-pound hunk of venison mounted in a fifty-pound block of ice as a souvenir. To supply this amount of meat the whole Chamber of Commerce went hunting for a week and didn't kill nothing—not even a member of the Chamber. So in order to keep this meal from being a flop it was necessary to resort to strategy (!). Dock Auble went to see one of the county's original inhabitants who seems to know what a rifle is all about. Next day the following conversation might have been heard with a dictaphone:

"Well, Dock, catchum meat. Gottum over Lauer warehouse right now. Good one. I suppose you have the tag on the horns and everything. No gotum tag and no place to put tag, Dock, but awful nice meat. Eight dollars cheap. Got two little ones you can have for four dollars for two."

under centralized state authority, initiated by this office, accomplished the approval of this desired dam legislation. The future development of the State of California is intimately related with and dependent upon the fullest economic utilization of the water resources of the state. The natural stream flow of the state is approaching exhaustion and the future water supply will be obtained chiefly

(Continued on page 23.)

Taming the Desert Cloudburst

"Travelers from the valley to Los Angeles by auto, who wondered why the state was spending money erecting huge mounds of earth along the highway beyond Kane Springs, had the answer given for them in Sunday's storm.

"Practically useless the greater part of the year, the flood protection system built by the State Highway Commission proves its worth in a single day when the wild waters rush down through gorges and the dry desert becomes an inland sea

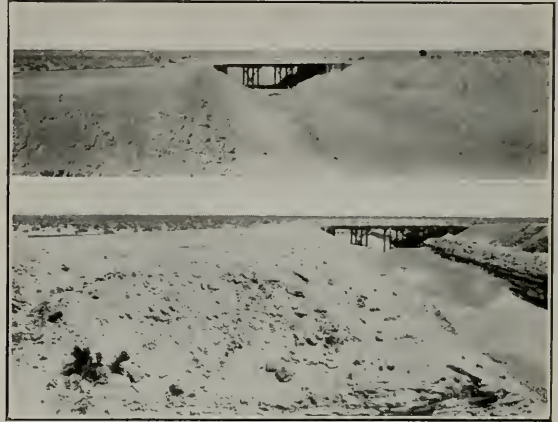
"In former years such an occurrence played havoc with automobile traffic to and from the valley on the Salton Sea route. Sunday's storm, thanks to the protective system, did little or no damage to the highway. The railroad, without such protection, is placed out of commission.

"People who have never seen it can not imagine the force and fury of these desert torrents which are created in a minute, rush wildly on their course, sweeping all in their path, and disappear as quickly as they start, leaving costly damage in their wake.

"The highway flood protection system is worth every cent it cost, even if its only benefit was to prevent a huge repair bill on the highway. The fact that it also prevents loss of time in transporting people and merchandise is additional justification for its construction."

The above editorial taken from the columns of an Imperial Valley newspaper paints a graphic picture of a new system of storm protection on desert highways in the south that has had its first test this year. The following telegram to headquarters from District Engineer E. Q. Sullivan, dated August 6th, also tells a graphic story:

Repeated heavy cloudbursts for past three days over all desert roads have caused damage on unimproved sections of routes 31, 58 and 64. Traffic is going through on all these routes. It will require several weeks to put some sections of these roads back in first-class condition, but most of these roads will be in good condition



Upper view, storm protection ditch and bridge over the ditch as constructed on the highway along the Salton Sea; lower view, picture taken from same location as above after the flood. Note that the channel has been dug deeper by the water and that the water went under the bridge without damage to the highway. Previous to construction of the storm protection system this water would have all crossed over the highway surface injuring or destroying the pavement.

again by end of this week. Union Pacific, Tonopah and Tidewater and Southern Pacific railroads are still tied up by washouts due to these storms. Damage to our new work where we have installed storm protection systems is confined to some minor fill settlements at bridges due to deep scouring of ditches. All ditches held and carried the flood waters and the storm protection systems worked as planned in protection of our new pavements.

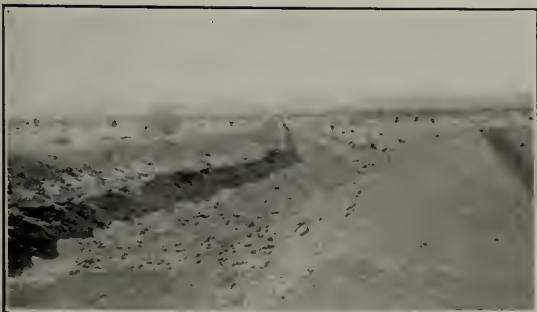
The condition which the new system of protective ditch work was designed to meet is a difficult one.

The rainfall in the desert area of Riverside, Imperial and San Bernardino counties is about five inches per year and usually falls in two or three localized storms in either winter or summer season and in cloudburst proportions.

The mountains adjacent to the highways are rocky and barren and have steep slopes, causing the streams to rise rapidly during the heavy storms and also to subside rapidly.

At the mouth of the canyon where the streams' velocity is retarded, due to the flattening of slopes, large debris cones are built up, and the streams do not follow a defined channel or otherwise the channels are shifting from one side to the other of the cones.

The highway following in the valleys passes over the various debris cones, and the



General view of storm protection ditch system.

usual practice was to place dips in the highway by depressing the surfaces of roadway through the various washes.

These dips were not satisfactory, as the floods would deposit gravel, mud and even boulders on the highway, or in other cases begin cutting at the lower edge of the road and washing out the road.

To overcome these washouts, drainage ditches are dug across the various washes, collecting the water and conveying it to the larger control ditches, which then cross the highway at various locations, bridges being placed on the highway across these control ditches.

The ditches vary in size from about 3 feet wide on small subsidiary ditches to 20 feet wide and 6 feet deep on the larger controls. The earth excavated from the ditches is placed in levees on the lower side of the ditch.

The first work of this kind consisted of constructing about 17 miles of ditches and eight



When the storm waters crossed at will.

timber bridges as a drainage system to protect the 19.7 miles of roadway between Trifolium Canal and Salada Wash on Route 26 in Imperial County. This contract involved moving 216,940 cubic yards of material from the ditch system at a cost of \$26,755.93, and the entire contract, with the bridges and incidental features, cost the state a total of \$58,369.70. This contract was awarded to Conway & Morrow on March 23, 1928, the contract being assigned by them to the Callahan Construction Company, who did the work. The contract was accepted on October 16, 1928.

Under another contract on the Mecca-to-Blythe highway in Riverside County Geo. Herz and Company constructed about 23 miles of ditches and 17 bridges to protect the 22.10 miles of roadway between 9½ miles west of Hopkins Wells and Black Butte. The protection system involved moving 303,861 cubic yards of material at a cost of \$36,463.32 and bridges costing an additional \$48,084.97, and

California Leads In State Aid to County Highways

WASHINGTON, D. C.—States are helping counties in local road building at a rate which makes unnecessary the extension of the federal aid principle to the construction of by-roads, according to a bulletin issued by the American Highway Educational Bureau.

Especial attention is called to the fact that counties already are receiving from states more than \$118,000,000 annually for use in local road construction.

From an examination of reports it appears that the largest sum going back to counties in any one state for the construction of local roads is in California. Here the total turn-back from license fees and gas tax amounts to over \$13,750,000 annually. When it is remembered that California's first bond issue to get road building under way amounted to only \$18,000,000, to be applied over the entire state, the sum now going to counties annually as a direct result of that first step shows how income from motor vehicles for road building purposes has been stimulated by the original program. In other words, one good highway investment is turning back increased capital for other investments of like character without having to look to bond issues or federal aid on outer roads.

was done in connection with grading and surfacing the roadway which the system protected. The contract was awarded on September 7, 1928, and accepted on July 18, 1929.

In a letter written subsequently to the August 6th telegram, Mr. Sullivan further wrote his impressions of the new system as follows:

The storm protection system along the Salton Sea, without question, paid back its entire cost in this one storm alone. Our past experience has shown that the damage to our pavement from a storm such as occurred on Sunday would far exceed the cost of the entire protection system had it not been constructed in advance of the storm.

If these storm protection systems were only partially effective they would still be a good paying investment. In building them we have never expected that they would work with 100 per cent perfection, but have expected there would be some breaks in the various system and some damage. I am glad to report, however, that there has not been a single break in our storm protection systems to date in spite of the very heavy storms in the past two weeks.

Signs and Roadside Structures; Necessity and Methods of Control

By DR. L. I. HEWES, Deputy Chief Engineer, U. S. Bureau of Public Roads *

THE question of encroachments on the highways came before you last November at the Chicago meeting of the American Association. In a paper by Mr. MacDonald was set forth the general situation. He has since had compiled, as of January 1, 1928, a summary of the laws of the several states which regulate outdoor advertising. There has also been publicity released by the bureau on the same subject. Newspapers have given very kind and important consideration to the question editorially and otherwise. Periodicals have also warmly supported the cause of freeing our highways of dangerous and distracting signs and annoying advertisements. There now seems opportunity to come to closer quarters with this rather important subject.

Rural outdoor advertising is displayed to attract the attention of persons on public highways. There is little evidence that the motoring public desire it but it is inseparably connected with highway operation. There is nothing to show its real necessity. It has accumulated at first gradually and later in certain sections with amazing speed. It was in the beginning ignored, later tolerated, and now it must be combated with legislation and regulation. As has already been stated by Mr. MacDonald, those that benefit most by the operation of highways are the worst offenders. Motor and motor supply advertisements are conspicuous. Gas and oil signs continuously spatter your vision. Accessories, parts, and supplies march over you as you go. Cheaper hotels scream at you. Eats and drinks choke you with their loud appeal. You anxiously round a strange curve to be informed that there are "Clean Beds 500 Feet." "Bigger and Better Gasoline at Smith's!" Your rocks are red and white and blue and yellow. You can not now in many sections escape the distraction and annoyance of outdoor advertising until you turn into the quiet unimproved side road.

Improving traffic conditions is essentially an element of highway operation. Without creating separate operating divisions the state highway departments are necessarily develop-



The Division of Highways seeks to set an example of beauty in its own structures. The above picture shows the entrance yard to the district headquarters in San Bernardino.

ing the operating function. It is a function of increasing importance. We have, for example, seen the growth of the traffic lane idea and the traffic stripes which are purely operating devices. We have seen also the painted school zone warnings; the crossing warnings on the pavement; the refinement of super elevation, widening of curves, and increased radii, increased sight distance at curves and hilltops, flatter crowns and safer guardrail. These are all elements of operation. So are the state traffic counts. More so are the caution, direction, and warning signs recently standardized by the American Association of State Highway Officials. It would seem also that the outdoor advertising is for the highway departments an important element of highway operation. Outdoor advertising screams loudest on the most densely traveled roads. These are the expensive roads built and maintained and largely operated by the state highway departments. These are the roads where the operating job, already difficult, is growing constantly more difficult. These are the roads where the states are straining every effort to improve the condition of travel. These are the roads where grade crossings must be eliminated with expensive structures. On such roads we know the state departments are alive to conditions of operation. There is constantly better maintenance—dust is eliminated, detours are improving, washouts are repaired with convincing dispatch, snow is removed with con-

* This paper was presented at the annual meeting of the Western Association of State Highway Officials, at Boise, Idaho.

stantly increasing efficiency. Yet it is on these roads that rural advertising thrives and confuses the driver.

This automobile driver is distributing wealth more constantly and over a wider area than was ever dreamed of. The advertiser and the roadside merchant quickly saw the possible profit.

We are grateful for much of the roadside service. Adequate filling stations on the highway, for example. Many such stations are noteworthy examples of artistic and beautiful treatment. However, there is a descending scale of merchandising down to the hideous examples constructed of burlap and bushes, and surrounded by repulsive advertising. It is in this connection illuminating to compare the treatment of the roadside by those depending upon highway traffic patronage with the treatment by state highway and other officials.

There are noteworthy examples of roadside beautification. State highway departments have planted shrubs and trees. Massachusetts, Pennsylvania and California are noteworthy examples. States are also establishing beauty spots and state parks. State laws that prohibit outdoor advertising within specified distances of parks and playgrounds evidence an underlying desire to be free of the ugliness of it. But, the outdoor advertiser is aggressive and even bold. He has not hesitated to appropriate highway operating words such as STOP, DANGER, TURN, etc., for his own insistent purposes. He has used the U. S. route numbering too. A pickle prince planted his number on the historical battlefield of Fredericksburg. Such actions are in strange contrast to the efforts of the state highway departments to serve the owners of the highway—the motoring public now pays the bills.

An examination of the fifty typed pages of the state laws throws much light on outdoor advertising. There has been considerable progress. Forty-two states have specific statutes relating to the subject. Many of the laws are new but too many reflect conditions of the horse drawn vehicle days.

There is in the legislation much variation. No state absolutely prohibits the display of advertising within public view of the highways.

There is, in many laws, an interesting note of caution. One gains the impression that advertising along the road has acquired a vested right; that although it is objectionable and even dangerous, it must be dealt with most carefully. In fact one state makes it a misdemeanor to remove advertising signs from the right of way. Recent legislation is ob-

viously the result of motor traffic; it tends to be more stringent in the older states when traffic is densest.

Outdoor advertising may be classified for convenience as owner advertising on the premises, legal advertising by public officers, display by advertising firms, display by other advertisers (not on owner's premises). Almost universally the property owner is protected. The advertiser must, under penalty of fine, obtain the property owner's consent and usually consent from the county or town official. The owner may also almost universally display advertisements for his own product or land—only in limited instances is he restricted.

There is almost uniform recognition by the several states that the right of way of highway is forbidden ground to all except legal advertisements. Yet there are several exceptions that permit regulated display within the highways. The state highway departments have had also to remove many signs from the state highway (the elusive tin sign however sneaks over the road fence to colonize on the barbed wire property line!

There is, in the newer laws, a marked evidence of the recognition of danger at curves and at railroad grade crossings. Many state laws forbid signs along the highway within a distance varying from 300 to 1000 feet of such crossings. Some states weaken, however, and permit legal officers to tolerate signs even within the danger limit when judged not obstructive to view. This tolerance is characteristic of the caution in many laws. Obviously a driver needs his whole attention on the road and crossing signals when approaching a grade crossing. Any advertisement may distract him. Similar provisions, with similar exceptions, apply to highway intersections and sharp highway curves. The incongruity of a warning flash displaying advertisement in the right of way is similarly obvious and yet several states, apparently to escape the cost of installation, permit such warning signals—when authorized.

It would seem that highway officials could demand that the rural right of way be entirely free of any outdoor advertising whatever. To eliminate further the advertising nuisance, wider rights of way would help. Where such wider ways can not be secured, a "set back" line inside the property would help eliminate dangerous, distracting, and disfiguring signs. A combination of set back lines, say one hundred feet from the center line, and a restriction as to the maximum size of any outdoor advertising would markedly reduce the nuisance.

U. S.-California Join In Traffic Study To Show Density

ON September 3d the state-wide cooperative survey, initiated by the U. S. Bureau of Public Roads and joined by the Department of Public Works began. This work is to last one year, covering 120 different localities throughout the state. The purpose of the Bureau of Public Roads in initiating this survey is to obtain authentic information as to the density of traffic throughout the six western states. Nebraska is included in the survey for comparison with the central states' condition.

In the scattered districts, twelve 8-hour counts during day periods and one night count will be taken. In the Los Angeles territory twenty-four 8-hour counts and one night count will be taken. The Los Angeles district includes Ventura, Saugus, San Bernardino and Anaheim. A count will also be made between Los Angeles and San Diego and at Jacumba, El Centro, Coachella, Banning, Victorville, Barstow and at other locations in the vicinity of Mojave and Bakersfield.

The original plan of the Bureau has provided for only 48 stations, in conformity with the work in other states. The Division of Highways has added sufficient other stations to furnish as complete information as possible for use in our study of traffic needs throughout the state.

The study has been undertaken in order that the federal government and the western states may know what the flow of traffic is throughout the year on the main transeontinental highways and on other roads in the federal-aid highway system in the west. In addition to California the highway departments of Washington, Oregon, California, Idaho, Nevada, Wyoming, Utah, Arizona, Colorado, New Mexico and Nebraska will join in the traffic survey which will extend over a period of one year.

Among the routes on which traffic will be measured are the historic Oregon Trail, over its entire length from Omaha to Portland, parts of the Santa Fe and Overland trails, and the long-distance motorbus routes from Omaha to Denver, Salt Lake City and San Francisco, and from Denver to Los Angeles by way of Santa Fe, and from Seattle to Los Angeles.

The transeontinental highways which give easy access to national parks and monuments and to national forests in the west carry a great and increasing traffic from the east and

HIGHWAY BEAUTIFICATION AS VIEWED BY EXPERT

By JOHN H. BATEMAN, Research Professor of Highway Engineering in the Louisiana State University

Rural highways should be designed and their environment developed to make them pleasing and interesting, capitalizing all the adjacent roadside scenery that may be available by developing and revealing it so that it will be readily seen and thoroughly appreciated. This involves not simply the ornamental plant along the roadsides but also the occasional removal of trees obstructing desirable vistas, the removal of unsightly objects, the obliterating of the roadside dump and the billboard nuisance, and a reasonable control of public service utilities in the erection of poles, stringing of overhead wires, and butchering of the roadside trees.

middle west, and they pass through public land states which have large percentages of unappropriated and unreserved public land, relatively low densities of population, and comparatively small revenues for road construction, and in these states federal aid has been of material assistance in closing gaps in the through routes.

In these Western States traffic has reached the point where it is necessary for the states to know the flow of traffic density, and composition on their roads, so that they can plan their highway systems on a good economic basis and plan for the removal of snow in winter.

The survey will show the number of vehicles using each of the main highways throughout the year, by days of the week and hours of the day, and the number of vehicles passing a given point at certain times of the day. It will classify the traffic according to types of vehicles, whether passenger cars, motor trucks, or motor busses, and the number of passengers in passenger cars. The importance of cities, towns, and sections of the state as the source and destination of traffic will be ascertained, and the number of vehicles from other states using the highways, and other information required by state and federal highway officials, will be obtained. The data will show population trends and will be useful in solving traffic regulation and safety problems. Surveys will be conducted simultaneously in each of the states.

OKLAHOMA—Along highways through bottom land subject to overflow, white posts are placed at intervals along the shoulders to indicate the location of the submerged pavement to drivers desiring to get through. Sometimes the 1-foot and 2-foot depths of water are marked.

SIGNS AND ROADSIDE STRUCTURES; NECESSITY AND METHODS OF CONTROL

(Continued from page 10.)

Wisconsin has an original "set back" provision for highway intersection protection:

"The triangles bounded by two adjacent intersecting highways and a line drawn between the points on the center lines—one thousand feet from the intersection of their center lines, are declared prohibited ground for the erection of any danger producing advertising signs, where such intersection is beyond the corporate limits of any city or village
* * *

Connecticut prohibits signs within 15 feet of the right of way line. Probably we can, as far as the rights of way themselves are concerned, hope for constantly tightening restrictions. Those states that now regulate only with fees and penalties have the power to be more and more severe and follow the lead of the others that have taken advanced positions.

When we consider the details of outdoor advertising on private property, we find a more difficult situation. We know that such advertising interferes with highway operations, that it mars the scenery, and that at times it is even dangerous. Wisconsin's "set back" law is significant. Massachusetts says: "The Division of Highways shall make rules for control of outdoor advertising on public ways or on private property within public view." Nevada regulates outdoor advertising on the public domain (as does Utah) and denies permit on any location which may measurably destroy the natural beauty of the scenery or obscure the view ahead or on curves, etc. Connecticut provides that: "The Superintendent of State Police may order the removal or change in location of any advertisement which obstructs a clear view along any highway." Advertising firms must there also take out a license and furnish a bond and no advertisement is allowed without specific permit.

There is sought a certain humor in some of the state laws. One state, as mentioned, penalizes the removal of advertising signs on the right of way.

Obviously our highways are, with respect to outdoor advertising, in a period of transition. A campaign of legislation is under way. There is ample evidence that much is objectionable. To free the highway for operation,

it will be necessary to scrutinize the owner advertiser more severely. The filling station must be sufficiently set back to allow the awaiting vehicle ample room off the highway. There are also encouraging reports of proposed set back stores along California highways. There can be indirect pressure brought to bear on those who persist in defacing the highways with their owner advertisements excessive in number and in area, ugly in color, silly in phraseology, and generally objectionable. The highways throughout the country are being equipped with standard warning and direction signs. These signs are for the most part scientifically located—they must not have a background of confusing miscellany of extraneous advertising. The condition of our highways with respect to outdoor advertising is not yet satisfactory and in many instances not safe; the best we can say is that we are progressing. It is possible that we may progress faster by organizing publicity. There are thousands of moving picture houses who might be willing to display suggestions that outdoor advertising on the highways is not wanted. The subject lends itself to the interest of women's clubs throughout the country. The press is already supporting the movement for cleaner roadsides. I would leave with you the thought that there is almost enough law already scattered through the books which, if selected from the acts of the various states, would change the situation abruptly. It is probably impossible to expect a law which would involve all the effective prohibitions and limitations established by the various states, but the direction in which we may progress is nevertheless well indicated. If, for example, we would eliminate all over the fence signs within 1000 feet of curves, highway intersections, and railroad crossings, and license, under bond and regulation, all other outdoor advertising, eliminate all advertising on public domain and public property, or that mars the scenery, then free the right of way entirely of signs, there would be little left about which to complain.

On the roadside merchant, we undoubtedly must use gentle but insistent pressure. He probably can be induced to beautify his surroundings. He must, without question, be induced to move his business sufficiently back from the traveled way so that there will be no interference whatever with the movement of traffic.

Jones was never an early bird at the office. One morning his boss exclaimed: "Late again! Have you ever done anything on time?"

"Yes, sir," was the meek, but prompt reply. "I purchased a car."—*Motorland*.

Experimental Road Surface Construction

By T. H. DENNIS, Maintenance Engineer

THE Division of Highways and the United States Bureau of Public Roads have recently started cooperative construction of a 10-mile experimental section of low cost type of oil-treated road surface on the Truckee River Highway between Boca and the Nevada State Line west of Verdi. The



T. H. DENNIS.

Bureau is also joining in the cost of maintaining this work for a 3-year period. The work is to be watched closely during this period and a careful record kept of both the construction and maintenance methods and cost, as well as the service obtained from the several combinations of materials. It is

expected that the information to be secured will be of material benefit not only to California with her tremendous highway program, but also to all the states with similar problems who look to the Bureau of Public Roads for advice. This work should be of considerable interest to those engaged in highway construction and maintenance work and to producers of asphaltic road materials.

The work is divided into twenty sections,

each one-half mile in length. Eight of these sections will be covered with four inches, loose measure, of three-fourths inch to dust crushed rock. These eight sections are to be bound up under traffic during the coming winter and their treatment by penetration and sealing with various grades of asphaltic oil will be taken up next year. The remaining twelve sections are to be surfaced with three-fourths inch crushed rock and gravel with and without fines. This material will be bound up immediately with various grades of fuel and asphaltic oils. Two of the oil mixed sections will be sealed before winter. The sealing of the remaining oil mixed sections will be determined by their actions under weather and traffic conditions.

The Truckee River road was selected by the Bureau as being best suited for the experiment. The location provides a winter climate with snow and frost and a summer climate fairly typical of a dry region. The traffic of nearly 1400 vehicles on peak days is sufficient to be a severe test for the type of road surface. The road was constructed in 1925. In 1926 part of the section was surfaced with three inches, loose measure, of crushed rock and a portion was surfaced with a four-inch thickness of volcanic cinders. This material was oil mixed in 1927. This limited surfacing with constant maintenance has given fairly satisfactory service during the past two years, but it is now disintegrating.

BUILDING ROADS UNDER BUDGET PLAN HAS MATERIALLY REDUCED OVERHEAD COSTS

(Continued from page 1.)

cent, which indicates that the ratio of overhead to total expenditures is steadily decreasing.

Our average overhead ratio for the current biennium will approximate 3.50 per cent. Using this percentage as compared to the average overhead since the inception of the organization of 4.85 per cent, the difference of 1.35 per cent on our budget of \$60,773,490 would represent a saving of \$820,542 in overhead during this two-year period, which will go into construction work on the roads.

The successful handling of an increased volume of work and responsibility by the

personnel of the Division of Highways has been the chief factor contributing to this saving. It has enabled the absorption of a large volume of engineering work at a low overhead cost.

PROTECTING ROADSIDE FLOWERS

The West Virginia Department of Public Safety is to undertake something new in the line of law enforcement. Orders have been given to all policemen and state troopers to lend every reasonable effort to enforce the law enacted at the recent session of the legislature against the plucking of flowers along the highways. The new law, which will be a surprise to many people, prohibits the picking of flowers within 100 yards of a highway without the written consent of the owners of the land on which they grow, and transportation of wild flowers and shrubs is also prohibited. The law, which was passed at the request of nature lovers, provides a penalty of \$100.—*Highway Topics*.

San Diego Teachers College Shows How State is Planning for Future

By GEORGE B. McDOUGALL, Chief of the Division of Architecture

THE State Normal School of San Diego was established in 1897, and the present buildings to care for about 600 students were erected on the 17-acre site. In 1921, due to added functions, the name was changed to State Teachers College of San Diego. The college now has about 1200 students and although some buildings have been added to the original 1897 group, there are approxi-

mately twice as many students as the present group of buildings should accommodate, and this leaves out of account the difference between the character and methods of the present educational program and those of the program as it was in 1897.

In view of this condition the project of selling the old college and building a

new one with the proceeds of the sale, and supplemental appropriations, was launched in January 1925. It had been generally approved beforehand by the State Department of Education and when proposed met with the unanimous approval of the San Diego city government, the San Diego city school department, and practically all of the civic and social organizations. A bill, modeled upon the legislation which in former years had authorized the sale of the property of the old Los Angeles Normal School and the removal of it to a new site was framed, and was introduced by Assemblyman Byron Walters of San Diego. It passed the legislature, and received the Governor's signature on May 22, 1925. Ap-

propriations were not made until 1929 for the reason that a bond issue, the proceeds to be used for the purchase of the college property, was not carried until May, 1928. Since that date strenuous efforts on the part of all of the state departments concerned and the San Diego city school department have made it possible to bring the project to its present status.

The old college property has been sold to the city of San Diego for \$325,000 and Governor Young included in the 1929 budget the sum of \$375,000, which sums taken together make a total of \$700,000 at present available for the construction and furnishing of a portion of the new buildings. In addition there is a \$25,000 1929 appropriation available for paying a portion of the cost of the construction of a trunk line sewer to serve a district of which the college campus is a small part. A site for the new college containing 125 acres has been donated to the state by the Bell-Lloyd Investment Company and in addition Mr. Alphonso Bell, president of this company, is donating \$25,000 in cash to be used in beautifying the campus. This total sum of \$750,000 is now being expended on the basis that the first building of the college will be ready for occupancy by September 15, 1930. Contracts have been let for the academic unit. Drawings and specifications for the library and science unit are ready for bids. Drawings and specifications for the training school, shop and steam plant will be ready for bids by December, 1929. The cost of the buildings is being kept in scale with the character, functions and permanence of the institution.

The Bell-Lloyd Investment Company and Mr. J. S. Perry, owners of adjoining property, are making expenditures required to construct necessary boulevards and roads giving access to the new campus from El Cajon boulevard, which connects the college district with the city of San Diego, also together with the city of San Diego for the bringing of an abundant supply of water to the campus from the city system.

It is exceedingly fortunate that Mr. Bell attached to his most generous cash gift the condition that it be used to meet the requirements for applying landscape architecture to



GEORGE B. McDOUGALL.

proceeds of the sale, and supplemental appropriations, was launched in January 1925. It had been generally approved beforehand by the State Department of Education and when proposed met with the unanimous approval of the San Diego city government, the San Diego city school department, and practically all of the civic and social organizations. A bill, modeled upon the legislation which in former years had authorized the sale of the property of the old Los Angeles Normal School and the removal of it to a new site was framed, and was introduced by Assemblyman Byron Walters of San Diego. It passed the legislature, and received the Governor's signature on May 22, 1925. Ap-



Ultimate proposed plan for San Diego State Teachers College.

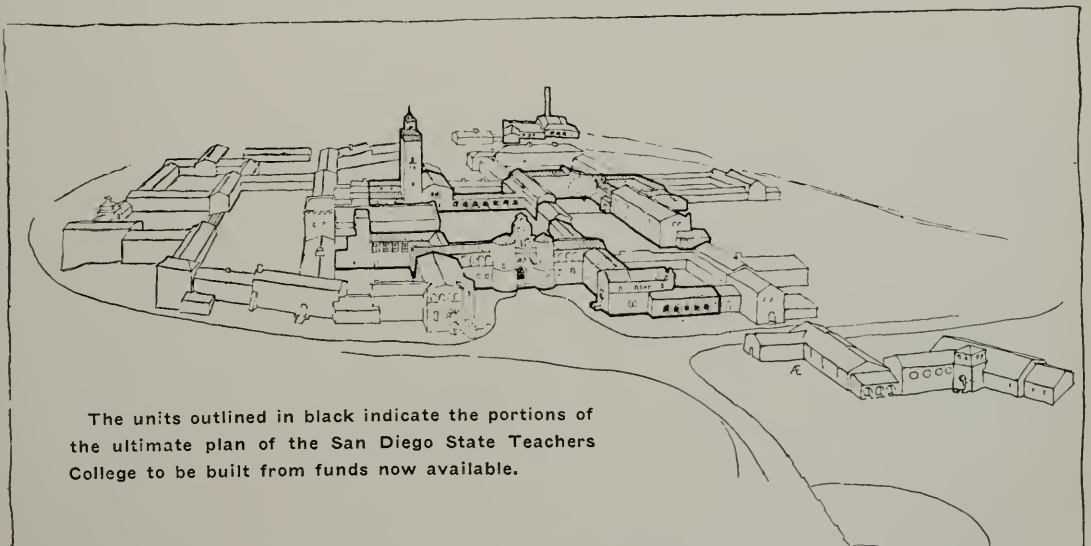
the campus. While the state recognizes the necessity of landscape architecture in connection with its institutions, demands for necessary initial building construction at new institutions in most cases absorb all the money that can be made available at the outset and improvement of grounds beyond entirely necessary roads and walks to give access to buildings has to be postponed.

The noted landscape architect, Mr. Mark Daniels, is in charge of the expenditure of Mr. Bell's gift; also of the laying out and development of the adjoining properties of the Bell-Lloyd Investment Company and of

Mr. J. S. Perry. This is most fortunate, since it will result in the coordinated treatment of the campus and of the surrounding very large properties in accordance with the highest standards of the art of landscape architecture.

The site of an institution plays so important a part in its architectural possibilities both as to plan and design, its practical and aesthetic aspects, as to make it necessary to the best results in selecting a site, in addition to consideration of location, accessibility, transportation, etc., to take into account architectural and engineering opinion regarding it.

(Continued on page 19.)



The units outlined in black indicate the portions of the ultimate plan of the San Diego State Teachers College to be built from funds now available.

Governor Urges
Highway Safety
Campaign

Beautify Approaches
To City

Maintenance Crew
Shows Loyalty

Radio Set Given
Prison Camp

Widening Work
Commended

Clippings, Letters and Comment



Dealing With State Highways

Non-Skid Surface
Marking Highways
To Aid Flyers

State Highway
Patrol

Ban Rubbish on
Highway

Highway Contracts
Show Big Increase

Write It
CALIFORNIA

Governor Young Urges Highway Safety Campaign.

In a letter to the mayors of various cities of California, Governor C. C. Young writes as follows:

The necessity for this campaign [Highway Safety], which has my approval and that of the various state departments concerned with traffic enforcement, is indicated by the state's traffic record for 1928. During that year 1876 citizens of California, including 217 children under the age of 15 years, lost their lives in traffic accidents on our streets and highways. Many other thousands were maimed and injured.

It is my judgment that concerted and continuous action by public officials, in cooperation with this statewide and representative group, will greatly minimize the carelessness, recklessness, intoxication and ignorance responsible for this toll of human life and limb. It is a fact that California's traffic record can be favorably compared with that of many large cities and is less than in many other states. However, the loss of 1876 useful citizens should challenge the attention of all communities.

Forty or more statewide organizations have banded together in the California Committee on Public Safety to reduce deaths and injuries in this state. The committee plans an educational campaign of thirty-days' duration, to be followed by a combined program of adequate and continuous traffic law enforcement stressing certain seasonal hazards.

As you know, California has just established a new State Highway Patrol, created for the purpose of adding to the pleasure and safety of motor travel in this state. This new Highway Patrol will wholeheartedly cooperate in the present educational campaign; and, as Governor, I am writing to ask if we may not have your own wholehearted assistance in promoting greater safety on our streets and highways, with a resultant reduction of traffic deaths and injuries.

* * * * *

Beautify Highway Approaches to Towns.

Here is some excellent advice from the editorial columns of the *Indio News*:

The approaches to towns, especially along the highways, give visitors first impressions and these impressions are very apt to remain despite anything they

see after they really get into the town itself. They argue that if the approach is neat and attractive the town is apt to be likewise and if the approach is messy and unkempt, with a lot of hot dog signs, the town is likely to be just as slipshod. The railroads learned this several years ago and they now make every effort to keep their right of way not only clean but in many instances very attractive. Any one who traveled thirty-five years ago can not help but remark the difference between the old yards and the new.

* * * * *

Desert Cloudburst Puts Heavy Task On Maintenance Forces

On September 18th, one of the desert's famous cloudbursts broke over Red Rock Canyon in Mono County about 7 o'clock in the evening, sending, according to Resident Engineer Victor E. Pearson's estimate, over 6000 cubic feet of water per second rushing down this narrow canyon. Due to the fact that the road was situated in the canyon the gravel was washed out in places and filled in at other points. All traffic was stalled for about five hours, and would have been tied up longer but for the prompt action and efficient work of Maintenance Foreman, John Callaway, Ed Monroe, and their crews. These men worked continuously with the cooperation of a force of men and machinery from the G. W. Ellis contract until the road was made safe for traffic. The crew together with Resident Engineer Victor Pearson, are to be highly commended for the spirit of cooperation, devotion to duty and efficient work performed in this emergency.

* * * * *

Radio Set Given to Prison Camp.

The Sanger Chamber of Commerce recently donated a splendid radio set to the prison road camp, now located on the Kings River lateral.

The following letter was written in appreciation of the gift:

Camp 19,
General Grant Nat. Park, Calif.
September 18, 1929.

Mr. Guy Johnson, Secretary,
Sanger Chamber of Commerce,
Sanger, California.

Dear Mr. Johnson:

Words furnish a poor medium of expression when it comes to expressing the appreciation and gratitude of the boys of this camp toward your organization, especially so toward Mr. Bacon and Mr. Brehler, for their activity and generous response in contributing such a splendid radio set to our camp.

If our "Thank You" sounds rather set, just know that it comes collectively from 120 men, who by suffering such denials, have learned that deeper sense of appreciation.

The impulse of kindness which moved the Sanger Chamber of Commerce will prove a lasting inspiration and source of pleasure to those boys who will be shut in for the winter, and the radio will bring them in closer contact with the greater outer world, and goal for which they are now preparing, and to which we all hope they will go, better and truer men.

The greatest happiness in life comes through the medium of sprinkling sunshine and happiness for others. To err is but human, and while these boys have followed questionable pursuits in life, with the necessary encouragement and proper guidance they can be led into a useful and happier life.

The spirit in which this vicinity has received a Prison Road Camp is most gratifying, and we hope to build a monument through these beautiful and inspiring mountains as a testimonial to your confidence.

Mr. Robert A. Rankin, Commissary Clerk, Division of Highways, Camp 19, will be in Sanger tomorrow and will call on Mr. Brehler, and in the event the radio is ready for delivery, he can bring it back to camp with him.

Again thanking you for your generous contribution, and extending to the Sanger Chamber of Commerce an invitation to our camp, that you gentlemen might have the pleasure of seeing our camp while still in its early stages of organization.

Yours very truly,

DIVISION OF HIGHWAYS.

By D. M. LEE, Supt.,
Camp No. 19,
General Grant Park,
California.

Non-Skid Surface For Ridge Route Section.

The following article is from a recent issue of the *Bakersfield Californian*:

The State of California will take a hand in taming the dangerous straight-away between Bakersfield and Grapevine Grade, wet-weather nemesis of hundreds of motorists during the last decade, it was revealed today in a message from the office of C. H. Purcell, State Highway Engineer at Sacramento. Placing a special nonskid surface over the most dangerous portions of the 29-mile stretch will begin within the next few weeks and before the rainy season starts in, Mr. Purcell stated.

A total of about six miles of the highway will be made skid proof. The sections to be treated will include the points where most of the serious accidents have occurred during past wet seasons, particularly at the foot of Grapevine Grade and farther north in the adobe sections.

Experts aver that the adobe land surrounding the highway causes virtually all of the wet-weather accidents. Dust from this land settles upon the highway and at the first shower, until the road is washed clean, this dust becomes the most slippery surface imaginable, engineers say.

Literally scores of automobiles have skidded and overturned at these points, statistics show, while untold hundreds have narrowly averted a similar fate. The accident and death toll, reported to be higher than on any similar stretch of open highway in the country, brought the necessity for action to the attention of the state and the construction which will begin soon is the result.

"The nonskid effect," Mr. Purcell says, "will be secured by covering a light application of heavy asphaltic oil with three-fourths to one-half inch crushed rock, which is following by rolling. It is hoped this type surface will tend to appreciably decrease hazards in this section for some time."

* * * * *

Widening Work Wins Commendation.

The Santa Cruz *Sentinel* comments as follows:

The California state highway maintenance crew is doing fine work on widening the highway, especially at curves on the route between Santa Cruz and Los Gatos. When the road was built it was impossible to look far enough ahead to the day when one road would fail to accommodate the traffic.

* * * * *

New Deal for the State Highway Patrol.

Says the San Francisco *Examiner* editorially:

Talking of service, State Highway Patrol Superintendent Biscailuz says:

"In case of emergency, the traffic officers will even change a tire for a distressed woman autoist."

What a change!

* * * * *

To Ban Rubbish on New Coast Highway.

The following article appeared in the news columns of the *Venice Vanguard*:

Considering the coast highway between Santa Monica and Oxnard one of the most beautiful sections of the state highway system, J. A. Stauff, who has charge of it, today issued a warning against throwing rubbish of any description on the state's right of way.

"We are determined to keep the highway clear of roadside litter which is usually to be found where so many automobiles pass, and will enforce section 150 (a) of the California Vehicle Act to do it," Stauffer declares.

The penalty for violation of this section is a fine of not more than \$500 or not more than six months in the county jail, or a combination of both.

Write it California— Not "Calif." or "Cal."

"NOT long ago," said the "Ukiah Republican Press" of August 2, "Marie Hinton Rea in 'The Press' had an editorial pleading for the use of the name of our state [California] in full, instead of abbreviating it. The article has since met a lot of approval, and this week there came to 'The Press' the following argument in rhyme from Al Utter":

I'm moved now to ask, is there any good reason
Why "Calif." and "Cal." shouldn't rest for a season?
And while these are resting let all good scribes try
"California" to write. And do you ask "Why?"
"Calif." (of Bagdad)! One thinks of a harem,
Ankle-length panties and no place to wear 'em;
These days of short skirts, eke stockings, if any,
Panties like that would look sweet on—not many.
If you use "Cal."—somewhat better reminder—
("Keep cool with 'Cal.'") and we did, that is, kind'er;
But, even at that, Cal is now quite passe;
California is not, age can't make her that way.

* * * * *

Marking of Highways Urged to Aid Flyers.

The following article emanates from Washington:

Air marking of principal highways as a navigating aid to flyers was urged in a statement today by Harry H. Blee, chief of the Division of Airports and Aeronautical Information, Department of Commerce. He announced that a pamphlet will be issued shortly giving proper specifications for the suggested markings.

The standard to be recommended, he said, will consist of simple markings involving in each instance the official route number preceded by the letters "U. S." in case of Federal highways, or by the state abbreviation in case of state highways. Wherever practicable, Blee said, the symbols should be lettered directly on the pavement, in white or yellow, using characters from 10 to 30 feet high, depending on the width of the paving.

The markings, he added, should read from west to east or south to north, depending on the general direction of the highway, and should be placed at all intersections and at intervals on each route of not more than 20 miles.

* * * * *

State Highway Contracts Show Big Increase.

The following is from the September letter of the Northern California Chapter Associated Contractors of America:

A letter has been received in the Chapter office from the State Highway Engineer Purcell, giving information upon the total amount of contracts awarded in 1928 and also for the first seven months of 1929.

From the figures below it will be noted that the contracts awarded prior to August 1st during 1929 total in excess of \$12,600,000, while the total contracts awarded during the entire calendar year in 1928 amounted to less than \$14,000,000.

Lauds Success In Obtaining U. S. Aid For Bay Bridge and Water Investigation

Under the heading "A Real Achievement," the Vallejo *Chronicle* editorializes as follows:

By far the most outstanding accomplishment of the Young administration thus far—and we can safely say that it has been marked by accomplishments—is the successful mission of Director of Public Works Meek in Washington, by which California is promised settlement of two vitally important and hitherto vexing questions—the proper advantaging of state water resources and the Bay Bridge.

It seems to us that the Governor and Director Meek have gone about this matter in an eminently proper and businesslike manner. They have aroused the interest and administrative abilities of our Engineer President and the President has manifested his interest by his usual short-cut method of procedure.

Of the two questions, the Bay Bridge may be the most spectacular and, in newspaper language, will certainly make the best "copy." It is of great importance and the people of the state have a right to an early settlement. From the standpoint of state economics, however, the water question is, and always will be, paramount.

The great valleys and cultivatable districts of California are semiarid. Production and domestic life depends upon the availability of water. Engineers tell us that there is ample water falling upon the Sierra and Coast Range sheds if all sources are developed as a part of one comprehensive state-wide plan. They also tell us that if each applicant is permitted to develop as he will each separate source, the result will be probable failure to conserve and utilize the desired maximum of available run-off, unnecessary extravagance, and inability to exploit to the fullest this particular factor among the state's resources.

We prophesy that from this act of the President, instigated by Governor Young, the greatest benefit to the state will accrue.

State Highway Contracts Let During 1928

Roads -----	\$12,497,000
Bridges -----	1,459,000
Total -----	\$13,956,000

State Highway Contracts Let During First Seven Months of 1929

Roads -----	\$11,445,000
Bridges -----	1,173,000
Total -----	\$12,618,000

The foregoing figures indicate that the State Department of Public Works is hitting its stride in highway work as it will be noted that the value of work let during the seven months of this year is very nearly as great as the work let during the entire twelve months of 1928.

Prosperity is the period when people run up bills that worry them during a business depression—*Detroit News*.

SAN DIEGO TEACHERS' COLLEGE SHOWS HOW STATE IS PLANNING FOR FUTURE

(Continued from page 15.)

Governor Young and the State Departments of Education and Finance recognized this, and the Division of Architecture accordingly had its proper part in the selection of the site for the new San Diego State College. This was in sharp contrast to the procedure used up to this time, where the sites of new institutions have been selected without the guidance of architectural and engineering judgment.

Upon the selection of the site, a careful survey to establish both its exact perimeter and its contours was made by the division, and was used in making a plot plan showing the ultimate group of buildings needed to accommodate 3000 or more students, to which number the Department of Education estimates the college will grow in the coming years. The plot plan also determines the locations for a stadium, play fields, tennis, hand ball and other courts, a swimming pool and outdoor theater, and for unobtrusive parking spaces for students' automobiles. The landscape architect will coordinate all of these elements with the campus roads and walks and with appropriate plantings and lawns in such a way as to give the largest artistic values to all the buildings and surrounding views. Bel-Air boulevard the main avenue of approach to the college, reaches the campus at its southwest corner, with the result that the through traffic east and west, which will be very heavy in both directions, will be diverted so as not to disturb or interfere in any way with college work and activities.

The closest cooperation between the Department of Education, the institution itself and the Division of Architecture has characterized the investigations and labors involved in finding the solution of the problem presented by this project. Very special interest attaches to the problem by reason of the fact that it involves the planning and designing of an entirely new group of buildings on a new and undeveloped site and in accordance with the most recent developments in this state of the educational unit called the teachers college.

The institution now provides and as it develops is to provide for many educational activities unknown 50 years ago. In addition to the old liberal arts curriculum, which remains as the foundation for later professional and technical studies, there are the modern collegiate curricula in such profes-

sional fields as commerce, journalism, dentistry, social service, accountancy, secretarial work and the various branches of engineering and teaching, also in the fields of Romance languages, chemistry, history, English, physical education and art. Other branches will be added from time to time. In addition the social and "extracurricular" life of the student body will be an increasingly important element in the process of educating as carried on at the college.

In laying out the plan of the ultimate group and of the particular buildings to be erected with funds now available, the Division of Architecture has cared for all these constituent elements of this great institution under the guidance of expert educational judgment provided by the State Department of Education and by the college. All these various units will ultimately have adequate housing and be so related one to another in their positions in the various structures of the group as to make for a minimum of lost motion and the highest degree of efficiency in the conduct of the Institution.

This project may be said to be the housing of education.

Education has been said to be the embodiment of the genius, the aspirations and the compromises of a people. It is the outcome of the history of the people, their temperament, their traditions and the spirit of their institutions. Educational policies, in the United States peculiarly, have sprung into being in response to the demands of the people and the spirit of the times. The same principle applies to good architecture, one definition of which is that it has always been and will continue to be a permanent historical record of the culture of the time of its conception and execution. Because of the complexity of the fine art of architecture and since it is carried on on a large scale with great possibilities of noble effects, it is the most important of the decorative arts. Decorative art in turn is fine art applied to the beautifying of that which has primarily a useful purpose. Another description of architecture is that it is the art which so disposes and adorns the edifices raised by man for whatsoever uses, that the sight of them contributes to his mental health, power and pleasure.

The Division of Architecture in solving this intensely interesting problem is using California architecture as adapted to our conditions and uses from the lovely Mediterranean styles, and is endeavoring to record in permanent materials the love of beauty which unquestionably possesses all our people whether consciously or not.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

B. B. MEEK.....Director
GEORGE C. MANSFIELD.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 7 OCTOBER, 1929 No. 10

September Awards Assure Heavy Major Improvements For State Highways

A total of nine state highway contracts were awarded during September by the Department of Public Works. These contracts provide for an improvement of 35 miles of highway, and for one grade crossing elimination. The contract prices total \$1,253,638.95. The following statement showing the contracts awarded and the improvement that they will secure:

MOTHER LODGE HIGHWAY—A section, 2.7 miles in length, to be surfaced with untreated crushed gravel or stone, 7 inches thick. This section lies between Drytown and Amador City, on a recently built grade and mainly on new right of way. The contract was awarded to Hemstreet & Bell of Marysville. Contract price, \$27,075.

COAST HIGHWAY—A section about 3 miles in length between San Diego and Oceanside to be widened with bituminous macadam borders at intervals, together with the construction of timber curbs. Due to heavy traffic, earth shoulders are difficult to maintain next to the pavement, and hence the reason for using bituminous macadam. The contract was awarded to the R. E. Hazard Contracting Company of San Diego. Price, \$33,686.

A section 9.6 miles in length between Atascadero and Paso Robles in San Luis Obispo County, to be graded and paved with asphaltic pavement. The pavement will be 20 feet in width on a roadbed 36 feet wide. This section of the Coast Highway lies along the Salinas River and carries a heavy through traffic. The improvements will eliminate a number of bad curves with restricted vision. Steele Finley of Santa Ana is the contractor. Price, \$268,258.50.

Construction of an undergrade crossing beneath the Southern Pacific tracks near Spence in Monterey County. The structure will consist of two concrete abutments with wing walls, and grading and paving with Portland cement concrete 250 feet of approaches. This superstructure will be built by the railroad company. This subway will eliminate the present dangerous grade crossing at this place. The contract

was awarded to Triberti and Massaro of Oakland. Contract price, \$24,555.50.

PACIFIC HIGHWAY—A section of highway about 0.6 of a mile near Mt. Shasta in Siskiyou County, to be paved with Portland cement concrete 20 feet in width. This constitutes a line change. The contract was awarded to the Mathews Construction Company of Sacramento. Contract price, \$22,648.

REDWOOD HIGHWAY—A section 11.9 miles in length between Petaluma and Ignacio in Sonoma and Marin counties, to be graded and paved with Portland cement concrete and bituminous macadam surfacing 20 feet wide. This project includes several radical betterments of line and grade, eliminating a 6 per cent grade, 300-foot radius curves, and saving some 4000 feet of distance. Unsatisfactory drainage conditions are improved. The contract was awarded to Hanrahan Company of San Francisco. Contract price, \$536,795.75.

Producing and stockpiling screenings for use later as surfacing between Smith River and the Oregon line in Del Norte County, a distance of 35.5 miles. The contract was awarded to Holderner Construction Company of Sacramento. Contract price, \$35,048.

GOLDEN STATE HIGHWAY (Valley Route)—A section 5.6 miles in length between Califa and the northerly boundary of Madera County, to be graded and paved with asphaltic concrete. This contract calls for constructing a graded roadbed and widening the existing 15-foot pavement to 20 feet. Reverse curves will be eliminated and the road straightened. This contract was awarded to A. Teichert & Son of Sacramento. Contract price, \$135,636.10.

TAHOE-PLACERVILLE HIGHWAY—A section in El Dorado County between Bay View Rest and 1 mile north of Eagle Falls to be graded 24 feet wide and rubble masonry retaining walls to be constructed. This project is approximately 1.8 miles in length, and forms a portion of the Truckee-Meyers section of the Tahoe-Placerville highway. It traverses rugged granite slopes overlooking Emerald Bay. The completion of this section will eliminate numerous hazardous curves, steep grades and narrow sections. The project lies at an elevation of about 6700 feet. The contract was awarded to Nate Lovelace of Sacramento. Contract price, \$179,936.

ACCEPTANCES OF CONTRACTS

Contract of Coolidge & Scott of Adin for constructing 3 reinforced concrete bridges across the South Fork of the Yuba River on the Victory Highway at an approximate cost of \$34,500; date of acceptance, September 6, 1929.

Contract of Webber Construction Company of Crescent City covering the work of surfacing with crushed gravel between Elk Valley and Smith River in Del Norte County on the Redwood Highway, about 3.8 miles in length, at an approximate cost of \$26,800; date of acceptance, September 10, 1929.

Contract of C. W. Hartman of Bakersfield for grading and surfacing with crushed gravel, a section in Kern County on the Walker Pass Route, between Pentland and the San Emigdio road, 12.3 miles, at an approximate cost of \$96,000; date of acceptance, September 10th.

Contract of Jack Casson of Hayward for applying a bituminous treatment to the existing surfacing between Klamath River and the Oregon line in Siskiyou County, a distance of 14.5 miles on the Pacific

Licensing Forms For Contractors Are Now Available

APPPLICATION forms for contractors license under the new law are now available. Every contractor must be licensed and to operate without such license is illegal and any contract which is entered into without being licensed can be questioned. Application forms are available at every A. G. C. office, every Builders' Exchange, in the office of every city clerk and county clerk in the State of California, as well as every building department of every city and at the Department of Professional and Vocational Standards, State Capitol, Sacramento.

A conference of representatives of the construction industry with Mr. James F. Collins, the newly appointed Registrar of Contractors, was held recently in Long Beach. During

this conference the application form, the license form and other administrative features were approved by those present.

The application form approved is in strict accordance with the provisions of the law and on it provision is made only for the information required under the act.

Under the law, Mr. Collins is the registrar charged with the administration of all provisions of the Contractors' License Law. He will be required to prescribe the application form, issue the license, issue renewals, investigate and act on all complaints filed under the law, suspend and revoke licenses and otherwise carry out the law's provisions. His main office will be at Sacramento but he will have branch offices in San Francisco and Los Angeles.

Commenting on this conference, the September letter of the Northern California Chapter, Associated General Contractors of America, says:

"Those who were fortunate enough to be present at this meeting, left with very great satisfaction in the knowledge that Governor Young has appointed a Registrar of Contractors whose experience, qualifications, judgment and personality admirably fit him for this particular administrative work.

"It was very evident that since his appointment Mr. Collins has given very thorough study to the Contractors' License Law, and will administer it in a way which will protect the industry, but at the same time discourage any unjust complaints against contractors."

CORRECTION OF ERROR

In the September issue of CALIFORNIA HIGHWAYS AND PUBLIC WORKS, there appeared on page two a cut captioned "Melones Dam on the Stanislaus River." The caption was in error and should have read "Exchequer Dam, built by the Merced Irrigation District, on the Merced River."

A quaint law was passed in England in the middle ages relative to the muddy and rutted highways of the day. According to the law bushes and trees were felled for 200 feet on either side of a road to prevent the gentle inhabitants of the country from rushing out and attacking travelers! The first toll for the maintenance of English roads was passed by Edward III in the fourteenth century.

In the interests of safe and sane driving we would point out that you are not so likely to lose control of your automobile if you keep up your payments. And buying a closed car is not necessarily saving for a rainy day.

Highway at an approximate cost of \$14,000; date of acceptance September 10th.

Contract of G. W. Ellis of Glendale for grading and surfacing with oil-treated crushed gravel, between Cottonwood Creek and Diaz Lake in Inyo County on the Los Angeles-Bishop-Inyo Highway, a distance of 10.3 miles at an approximate cost of \$113,000; date of acceptance, September 16th.

Contract of C. W. Wood of Stockton for placing a bituminous macadam pavement between Auburn and Colfax in Placer County on the Victory Highway, a distance of 13.8 miles at an approximate cost of \$102,000; date of acceptance, September 16th.

Contract of Claude Fisher of Los Angeles for constructing a bridge over the Santa Clara River and an overhead crossing over the tracks of the Southern Pacific Railroad, and grading and paving roadway approaches about 3 miles north of Saugus in Los Angeles County, at an approximate cost of \$227,000; date of acceptance, September 16th.

Contract of Young Brothers of Berkeley for grading roadway at Spring Hill just north of Mt. Shasta City in Siskiyou County on the Pacific Highway for a length of road 0.7 of a mile at an approximate cost of \$35,000; date of acceptance, September 21st.

Contract of Paul M. White of Santa Monica for constructing an overhead crossing over the tracks of the Southern Pacific Railroad and a culvert near Benham in Santa Barbara County on the Coast Route at an approximate cost of \$103,200; date of acceptance, September 26th.

Contract of Southwest Paving Company of Los Angeles for grading and surfacing with oil-treated crushed gravel or stone, a section 7.3 miles in length situated between Cinco in Kern County and a point 7 miles south of that place on the Saugus-Alpine Junction Route at a cost of approximately \$78,000; date of acceptance, September 25th.

Contract of Johnson Simpson & Company of Los Angeles for constructing an overhead crossing over the Santa Fe tracks and a culvert at Irvine in Orange County on the Coast Route at an approximate cost of \$60,800; date of acceptance, September 25th.

This Is Massachusetts Plan For Beautifying Its Roadsides

1 1 1 1 1 1

TO OBTAIN the best results in roadside planting, individuals entrusted with such work should have a wide knowledge of vines, shrubs, and trees, says James H. Taylor, highway landscape supervisor of the Massachusetts Department of Public Works, writing on progress in roadside planning in the August issue of *Public Roads*, a bulletin of the Bureau of Public Roads, U. S. Department of Agriculture. They should know the height and spread of the planting at maturity, and its possibilities of contrast in shape, texture, and color with other planting, and also they should know what the planting looks like at different seasons of the year, and when and how to plant and how to care for all kinds of roadside development, he says:

"We are educating a small army of men whose primary interest is in the road surface and whose natural attention is to lines and grades, 'pot holes' and breaks, tar barrels and side drains, and interesting them in vines, shrubs, and trees and the aesthetics of the roadside," writes Mr. Taylor. "Responses differ as men differ; the result is not uniform but the general tone is one of splendid cooperation.

"Depressions in the road surfaces are known to the road maintenance man as 'pot holes.' The roadside developer detects what may be called pot holes in the highway landscape and corrects the situation, sometimes by filling in and sometimes by removing detracting or barrier material.

"All roadside pictures exist in three parts—foreground, middle-distance, and background. The planter must know the dimensional limits and contrastual possibilities in shape, texture and color; bark, leaf, and flowers. He must know the spring aspect, summer maturity, autumn glory, and winter value; in other words, he must have a complete knowledge of growing things.

"Trees carefully planted and cared for grow but tend to become topheavy with foliage. This requires intelligent removal of enough of the tops to give them a chance to resist wind pressure, not by mere shortening of the terminals, which produces four or five sprouts instead of one, but by the removal of

entire branches, cutting them off at the outer edge of the collar of the limb. Proper pruning leaves the tree symmetrical.

"In Massachusetts, three tree crews are kept in operation throughout the year, each crew consisting of a tree agent and three men. Two of the crews are equipped with a camp wagon—a small house on wheels—fitted to house four men comfortably.

"Plantings, in the main, are confined to new right of ways, since their widths of 60 feet or more allow greater opportunity for landscape development. Such locations assure a reasonably undisturbed future, but it is a rule in every case to plant as near the property line as possible."

The planting procedure, says Mr. Taylor, is as follows: A blue print showing the right-of-way lines and road location is sent to the Palmer station, where the state nursery is located. The designer makes a study of the road and indicates the proposed planting on the blue print. The locations of plants or trees are then staked and the pits dynamited, dug, and where necessary refilled with the best loam obtainable. Tree pits are 3 feet in diameter and 2 feet deep. The planting order is filled by the state nursery, packed on trucks and trailers, and set out in the field. A space 3 feet in diameter around each plant is grubbed and kept free from weeds, and water is supplied if needed. After the planting is well started it is given a final inspection and turned over to the district maintenance forces for care.

"Trees should have constant and thorough inspection," says Mr. Taylor, "for it often happens that a tree presenting a fair face to the road is merely a shell from the other side and is ready to fall with the first strong wind. Dead trees and limbs deface the picture; they are a menace to traffic and should be removed at once."

Saint Peter scanned the latest applicant for admission to the pearly portals.

"What did you do on the earth?" he asked.

"I was a truck driver," said the applicant.

Saint Peter jumped several feet into the air. "Open the gates, boys!" he shouted. "Give this fellow the right of way."

New Law Big Aid In Keeping Highways of State Attractive

CLEANING UP and improving the appearances of highways is being made more effective by the State of California through a law now effective prohibiting fruit, vegetable and other peddlers from using state highways for the sale of their wares.

This enactment, which is designed to provide further for the care and protection of the highways, was added this year by the legislature. The new section of the statute reads as follows:

"SEC. 7½. Any person who sells, displays for sale, or offers to sell any merchandise, fruit, vegetables, produce, food, or any other goods from any vehicle, motor trailer, semitrailer, wagon, push cart, stand, structure, or building standing or situated wholly or in part on the right of way of any state highway, or any part thereof, is guilty of a misdemeanor. Nothing herein contained, however, shall be deemed to prohibit a seller from taking orders for or delivering any commodity from a vehicle on the part of the right of way of a state highway immediately adjoining the premises of the purchaser. It shall be the duty of all peace officers and state traffic officers to enforce the provisions of this section."

HIS JOB IS TO SEE THAT DAMS ARE SAFE

(Continued from page 6.)

by storage, so that dam building will increase rather than diminish, both in the size and number of dams. It is, therefore, imperative that the responsibility for the supervision of dams in the state be placed under centralized authority. I feel that in placing Mr. Hawley in charge of the supervision of design and construction of dams the state has secured the services of a man eminently qualified to carry on this work, and that every effort will be made by him in supervising dams to the end that the people of California may be assured rigid enforcement of the provisions of the act making for the safety of dams."

PREQUALIFICATION OF BIDDERS

The last legislature passed the law signed by Governor Young requiring the licenses of contractors on public work. The Division of Highways has prepared a questionnaire for submission to contractors and is now working out a procedure for prequalification. This has been done in conjunction with the Association of General Contractors of America and the surety companies' association, the purpose being to work out a plan that will be satisfactory both to the state, the contractors and the surety companies.

THE GROWTH OF MOTORING IN CALIFORNIA

(Continued from page 4.)

The accompanying tables show the growth of motoring by county in California for 15 years. It is interesting to note that not a single county shows a loss in motor vehicles although several of the mountain counties have suffered material losses in population. Los Angeles County offers a fairly good example of the growth in 15 years, the total in 1914 being 43,099 as compared with 755,775 for June 30, 1929.

County	January 1, 1914	June 30, 1929
Alameda	8,449	133,166
Alpine	9	68
Amador	165	2,246
Butte	1,019	13,756
Calaveras	155	2,301
Colusa	425	4,287
Contra Costa	930	22,734
Del Norte	56	1,621
El Dorado	154	2,745
Fresno	4,488	55,351
Glenn	490	5,263
Humboldt	994	13,815
Imperial	1,515	20,709
Inyo	187	2,682
Kern	2,521	33,556
Kings	870	9,289
Lake	168	2,994
Lassen	181	3,942
Los Angeles	43,099	755,775
Madera	343	5,758
Marin	686	10,303
Mariposa	44	1,175
Mendocino	463	7,082
Merced	634	13,156
Modoc	136	2,414
Mono	12	394
Monterey	892	17,247
Napa	687	7,434
Nevada	169	3,094
Orange	3,761	46,145
Placer	437	8,383
Plumas	98	2,133
Riverside	2,128	29,251
Sacramento	3,419	43,542
San Benito	328	4,335
San Bernardino	3,198	44,404
San Diego	5,665	70,697
San Francisco	12,081	142,321
San Joaquin	2,500	36,804
San Luis Obispo	661	11,061
San Mateo	1,258	22,161
Santa Barbara	1,796	22,613
Santa Clara	3,941	52,028
Santa Cruz	986	13,984
Shasta	340	4,833
Sierra	64	750
Siskiyou	379	8,093
Solano	848	12,437
Sonoma	1,913	24,785
Stanislaus	1,791	24,287
Sutter	333	5,826
Tehama	428	5,471
Trinity	30	642
Tulare	2,412	30,571
Tuolumne	248	3,072
Ventura	1,410	20,601
Yolo	798	9,028
Yuba	324	4,908
Totals	123,516	1,859,523

ARIZONA—A proposed new highway recently surveyed through the northwestern part of the state would reduce by 70 miles the traveling distance between Kingman and Las Vegas, Nevada, and would connect with the proposed Black Canyon Dam across the Colorado River.

A Plea For Beautiful Highways

By RAY LYMAN WILBUR, Secretary of the Interior

WHEN Daniel Boone made his celebrated trip out to the wilds of Kentucky he must have gone through a magnificent forest as he followed the game and Indian trails. He traveled at a rate slow enough to enjoy the green fields and the clear streams, the beautiful animals and the flashing birds, the bright flowers and the gay butterflies. We can understand why he brought back those glowing tales which stimulated the great migration over the mountains to settle the Ohio River country.

Now a traveler speeds along on the railroad or on a fine highway and often is more impressed by the ugly back yards, the smoke-stained shops and factories, the turbid rivers and the cheap frame we have built around our highways than by the beauty of the landscape. The great forest is gone. In some places we are trying to get it back again. But nearly everywhere there could be beauty of plant and tree and attractive homes and fertile farms. In many places there is great charm, but the buildings and other things near the highways block the vision.

It is like having a cinder in your eye. Even the Royal Gorge is disappointing to a man busy with something in his eye. America is so beautiful, but man has done so many things to it that it often looks its best after a fresh fall of about six inches of snow. We have been in too big a hurry to cut things down

and to cut them up, to build fast and without much thought and to make money with a rush.

We now have settled up the whole country from shore to shore and can now quietly go about the task of making the most of what we have left and of building for the future. We can afford to spend some time and effort in making things look better. Why not stop living so much of the time in the midst of bewildering signs, tawdry buildings, weeds, waste paper and old cans? There is a movement on for attractive wayside stands, harmonious with their natural surroundings. Trees are in the nurseries ready to plant, flower seeds are cheap, exercise with a hoe is just as healthful as golf, and your neighbor can enjoy your garden with you if your hedge is not too high.

Our country has become our common possession from the standpoint of beauty or lack of it. A little gasoline takes us wherever the roads go. If we can all get interested in a beautiful America we will become a different people and we can all enjoy again those natural charms that quietly but effectively influence our character and thinking. I am afraid we will have to expect most in this direction from our children. Too many of the old folks have become accustomed to disorder and grime and cheap junk architecture. The children of today have to live in the world of tomorrow and they might as well work to make it more livable.

Assistant Superintendent of Highway Patrol Named

H. Roy Youngblood, undersheriff of San Joaquin County for the past 18 years, has been appointed assistant superintendent of the California Highway Patrol. He will assume his new duties on November 1st.

The Stockton *Record* editorializes on Mr. Youngblood's appointment as follows:

"The appointment of Undersheriff H. R. Youngblood to the office of Assistant Superintendent of the California Highway Patrol will meet with the approval and pleasure of his many friends in San Joaquin County.

"As secretary-treasurer of the California Sheriffs' Association for several years, Mr. Youngblood won a high place for himself in the esteem of the peace officers of California. He has proved himself loyal and efficient in the performance of all his duties in connection with that office and there is every reason to believe that as assistant superintendent of the California Highway Patrol, he will add to the laurels he has won as an official of the California Sheriffs' Association."

IOWA—Pavement projects recently completed have cost an average of \$26.184 a mile. Costs for various items were reported as follows: aggregate, 13.2 per cent; cement, 22.4 per cent; reinforcing steel, 3.5 per cent; freight, 21.1 per cent; grading, 7.7 per cent; miscellaneous contractors' costs including profits, 26.2 per cent; engineering and other charges, 5.9 per cent.

Irrigation
Dams
Reclamation
Flood Control

Review of September Activities

In the Division of Water Resources

EDWARD HYATT, Chief of Division

Water Rights
Snow Survey
Water Resources
Investigation
River Flow

IRRIGATION DISTRICTS

The revision of the California Irrigation District Laws to conform to the amendments made by the 1929 Legislature has been completed and is now in the hands of the State Printer.

In the matter of the request of the Buena Vista Water Storage District for the validation of its bond issue in amount of \$942,731.11, action of the California Bond Certification Commission has been withheld pending certain adjustments to be made satisfactory to the State Banking Department.

The California Bond Certification Commission has concurred with the State Engineer in his recommendation that the request of the Ladera Irrigation District for the approval of a bond issue in the amount of \$200,000 be denied.

The California Bond Certification Commission has acted favorably upon the request of the Nevada Irrigation District that the district be permitted to expend from its construction fund \$6,201.26 for emergency work in the district.

DAMS

Copies of the rules and regulations and application forms have been mailed to the owners of 442 dams. Arrangements have been made to place these papers in the hands of the owners of 93 additional dams through a representative in the field. Notices were sent to the owners of all dams known to be under construction on August 14, 19 in all, which were less than 90 per cent completed on that date.

Inspections have been made of all dams under construction. These include the Salt Springs Dam on the Mokelumne River, a rock fill dam being built by the Pacific Gas and Electric Company which will be the largest rock fill dam in the world and the San Gabriel Dam of the Los Angeles County Flood Control District.

Further consideration has been given to Lake Hodges dam by the consulting board appointed for that purpose. A consulting board has been appointed to consider problems at the Juncal site on the Santa Ynez River because of difficulties arising from the geological conditions at that site.

An engineer has been assigned to work in Lassen and Modoc counties, where about one-seventh of the dams in the state are located, to determine the ownership which is unknown in many cases, make inspections, and assist in the preparation of applications. It will also be necessary to secure a great deal of statistical data, as it is known that this is very meagre at present, especially in regard to drainage areas and necessary spillway capacity.

The sites for two new dams, Mud Springs and Wrigley, were inspected, and inspection made of the following dams now under construction: Salt Springs, Chenery, Lyons, Calaveras (3), Spicer Meadows, Pickering, Crouch, Skye Valley No. 2 and No. 3, Burbank Reservoir No. 5, Glendale Park Manor, Felt Lake, Sunset, Juncal and Ridgewood.

Inspection was also made of the following old dams: Heeney, Carson River, Burney Creek, Catalina Island and Burbank Reservoir No. 4.

Early in September there was a partial failure of a small dam of the city of Burbank, which as a city-owned dam, had not been previously under the jurisdiction of the division. Inspection was at once made. Burbank reservoir No. 4 is a storage of about 7,000,000 gallons capacity built by excavating a basin in a small canyon above the city, closing the lower side by an earth dam, and lining the whole basin with concrete, and covering the whole with a roof. A leak developed through some portion of the lining or through some of the joints. This water found its way to a hole or weak strata under the northerly portion of the embankment, and when it was discovered about 10 a.m. September 7, a considerable flow was emerging. This developed to a maximum of about two cu. ft. per sec., and eroded a hole under the embankment about one foot in diameter. The lining against the embankment cracked in several places, but did not collapse, although a large hole was eroded at one point back of the lining. All the leakage that occurred escaped through the cracks in the lining. At 10.30 a.m. the waste gate from the reservoir was opened, and by 4.30 p.m. the reservoir had been drained. The city is making a complete survey of conditions prior to preparing an application for repairs. No lives were endangered, and no property damage was suffered with the possible exception of a small amount of erosion at back of a partially improved lot.

RECLAMATION AND FLOOD CONTROL

Maintenance of Sacramento and San Joaquin Drainage District.

The irrigation of willows planted for the protection of the east levee of the by-pass has been continued. Two small crews have been placed at work clearing out brush and second growth in the Tisdale, Sutter and Butte Slough By-passes. The Sacramento River revetment at Freeport, Project No. 5, has been cleared of weeds and willows and several washes along the inside of the piling have been filled.

Remember, girls, in seeking your model husband, there are two models, sport and working.—*Council Bluffs Nonpareil.*

Emergency Flood Control and Rectification of River Channels.

Tentative arrangements have been made to cooperate with Reclamation District No. 532 in bank protection construction at the junction of Georgiana Slough and Mokelumne River. The cost of the work will be approximately \$3,000.

Surveys have been completed and plans are in preparation for protection works on the Feather, near the Nicolaus Bridge, in cooperation with Sutter County. Thirteen thousand dollars is available for this work.

Surveys have been completed and plans are in preparation for bank protection work immediately below Isleton, on the Sacramento River.

Landowners of Butte County desire the cooperation of the state in providing rectification works on the Feather River at Robinson Bend, above the Gridley road. It is reported that Butte County has appropriated \$4,000 for this work, and it is expected that arrangements can be completed shortly to proceed if a feasible plan for the work can be found. The landowners are also making an attempt to interest the California Debris Commission in this work.

Sacramento Flood Control Project.

The Reclamation Board on August 21 requested the Department of Public Works to undertake clearing work in the Feather River channel and in the by-passes of Project No. 6, in accordance with plans approved by the board. The estimated cost is \$92,558. At the meeting held on September 18, the Reclamation Board passed a resolution which will make the funds available and permit the work to proceed.

Surveys have been made and plats and descriptions have been completed for the rights-of-way necessary for the West Intercepting Canal, a portion of the project to be built by the California Debris Commission.

Plans are being prepared for submission to the Reclamation Board for the clearing of the channel of the American River from the "H" Street Bridge to the Southern Pacific Bridge, as a part of the flood control construction program approved by the Reclamation Board. This will involve the removal of approximately 1200 piles and other obstructions. Money is available for this work, and it will be handled in the same manner as the clearing mentioned above.

The Reclamation Board has authorized this office to construct a road approach to the top of the east levee in Sutter County, in accordance with an old right-of-way agreement. The cost of this will probably not exceed \$300.

Russian River Jetty.

The construction of the jetty at the mouth of the Russian River, near Jenner, has been proceeding satisfactorily since the work was taken over on August 16. The work of driving piles in the jetty structure is nearly completed, so far as it is proposed to carry it this season. All equipment for the railroad and quarry is now in operation and rock is being placed in the jetty. A short railroad trestle is being constructed, so that the railroad can be placed on a high sand bar instead of the low sand spit, to prevent the road being washed by heavy rollers and to permit the delivery of rock continuously. The work will be carried on as late in the season as the weather will permit.

Pajaro River Flood Control.

The counties of Santa Cruz and Monterey have each appropriated \$1,000 for work in the Pajaro River, in

accordance with the provisions of Chapter 524, Statutes of 1929. This will make available for immediate use a fund of \$4,000, which it is proposed to expend in further clearing the channel of growth and obstructions, which was commenced last year when a total of \$7,500 was spent on the work.

Fish and Game Commission Work.

No work has yet been done toward the construction of the jetty at the mouth of the Navarro River, as the question of right-of-way has not been settled. Progress on the construction of the channel at the mouth of the Salinas River is being held up for the same reason, pending a decision from the Attorney General in respect to this right-of-way.

WATER RESOURCES INVESTIGATIONS

Organization.

Considerable time and effort has been spent in effecting an organization for carrying forward the Water Resources Investigation provided for by the Legislature of 1929. Civil Service examinations were held the latter part of July and the first part of August. List of eligibles was available the latter part of August. A number of men have been employed during the past month.

San Joaquin Valley Investigations.

Two survey parties were put into the field September 9th to make a topographic survey of possible reservoir sites on the North Fork of the San Joaquin River above the mouth of Big Creek. It is expected that five or six weeks will be required to complete this work.

The compilation of records on about 3500 wells covering a period in some instances of ten years in the southern San Joaquin Valley is in progress. Elevations of these wells referred to U. S. G. S. datum have been determined by the various districts in this area in cooperation with this division. This work is complete.

The classification of the lands in the San Joaquin Valley south of the Merced District and Patterson has been completed and reports rendered thereon.

The crop survey is being continued.

Preliminary office studies are in progress to determine the economic size, grade and location of exchange canals from San Joaquin River to Kings River and from Kings River to Kern County. It is planned to place a survey party in the field before the end of the month for the purpose of laying out these canals.

Water supply studies of the major streams have been completed and studies are in progress to determine the yield of the unmeasured areas.

Sacramento Valley Investigations.

A survey has been completed in Indian Creek on Feather River downstream in Indian Valley for the purpose of locating the most feasible and economic dam site. A geological examination has been made and a report rendered thereon. Geological examinations have also been made of the Baird dam site on the Pit River; Iron Canyon and Keswick dam sites on the Sacramento River; Fairview and Lewiston dam sites on the Trinity River and Whiskytown dam site on Clear Creek.

Office studies are in progress, some of which are complete, to determine the utility of five reservoir sites on the Upper Feather River for irrigation and power in the statewide plan of water development.

Extension of the water supply estimates for the Sacramento Valley streams from 1925 to 1929 is in progress. Seasonal indices of wetness for the several precipitation divisions in Northern California have been calculated for the same period.

Salinity Investigation in Upper Bay and Delta of Sacramento and San Joaquin Rivers.

The investigation to determine the facts on salinity conditions in the Upper Bay and Delta of the Sacramento and San Joaquin rivers has been continued throughout the month. Salinity samples have been taken at four-day intervals at the 74 regular observation stations and at more than one-third of these stations samples have been taken at both high and low high tides.

To determine the variation of salinity content of depth and tidal stage a total of eight special salinity surveys have been made at eight stations during the month. In addition to these a total of ten special salinity surveys were made at cross-section stations at Antioch and Collinsville. These surveys involved the sampling, at various depths at three predetermined points, at each station and also velocity measurements at the various points of sampling through a complete tidal cycle.

Seventy-five miles of levels tying in the tide gages which were established have been completed. These levels have been referred to U. S. G. S. datum.

Stream flow measurements to determine the distribution of flow among the tidal channels for various stages on the Sacramento and San Joaquin rivers have been continued. Five measurements have been made on Three-mile Slough; one on Georgiana Slough; one on Sutter Slough and on Steamboat Slough; and one on Sacramento River below Walnut Grove, a total of nine measurements. These measurements in each instance were carried through a complete tidal cycle.

A total of about 4500 salinity samples have been obtained during the past month and are being analyzed by the laboratory of the Highway Commission.

Southern California Investigations.

Field work in connection with the Southern California Water Resources Investigations has been undertaken in the Mojave River Basin in cooperation with the water resources branch of the United States Geological Survey, and additional stream flow gaging stations are being established to cover all major streams in southern California.

WATER RIGHTS

Applications to Appropriate.

During the month of August, 35 applications to appropriate were received, 22 were canceled, 22 were approved, and 7 were revoked.

Snow Survey.

Rapid progress is being made and splendid cooperation is being experienced on the part of the U. S. Park Service, the irrigation districts and the power companies in establishing snow survey courses. It is expected that all major stream basins of the Sierras will be covered to greater or less extent in the work this year—some of the basins quite intensively.

Sacramento-San Joaquin Water Supervisor.

Sacramento River flow reached a minimum stage of approximately 2350 second-feet at Sacramento early

in August and started a rather rapid rise about September 1st. The minimum flow in 1924, which is the lowest of record was approximately 700 second-feet, and the minimum flow in 1927 which was the highest since 1924, was approximately 3500 second-feet.

MOTOR VEHICLE DIVISION REPORTS

FRANK G. SNOOK, Chief

LAW ENFORCEMENT

The following statement shows the activities of the Law Enforcement Bureau of the Division of Motor Vehicles for the period from January 1, to July 31, 1929:

Motorists stopped by traffic officers of 49 counties—113,941.

Reasons for above action—

Speeding	13,378
Light infractions	52,182
Violating "Rules of Road"	12,899
Violations in operation of trucks	9,151
Miscellaneous offenses	26,331

Total 113,941
Number of arrests—53,512.

Charges—

Driving while drunk	516
Reckless driving	1,458
Speeding	7,765
Defective lights	31,818
Operating trucks illegally	1,202
Various other violations	4,966
Total	53,512

Disposition of the 53,512 arrested shows that 12,366 were fined by the courts, and their fines total \$281,001.66. Reports show that 15,460 cases have been dismissed.

In addition to the above, the county traffic offices collected \$38,330.55 in delinquent fees on motor vehicles, and \$165,290.90 for the regular registration of motor vehicles. The sum collected for regular registrations is collected chiefly at the renewal period, while that which represents delinquent fees is collected throughout the year while patrolling the highways and checking trucks for overweight and other violations.

The total mileage covered by the officers from January 1, to July 31, 1929, is 3,138,794.

During this period the traffic offices passed 132,916 applicants for operator's licenses, and rejected 5270 for various reasons. 85 stolen cars and 391 abandoned cars were recovered for this period.

CALIFORNIA HIGHWAY PATROL

During the early part of September, E. W. Biscailuz, Superintendent of the California Highway

Patrol, delivered new cars, which were painted the distinctive color "white," to all state inspectors for their work. Plans are being formed that will enable the Division to have the motor equipment of all traffic officers painted this color in a short time. This distinctive color of equipment will be a great help to the Division in enforcing the act, and will relieve the feeling of the public that it has been impossible to tell an officer from any other individual when riding in a motor car.

During the above period the Division of Motor Vehicles received reports from traffic offices of 49 counties. Up to August 14, 1929, there were four counties, namely, San Francisco, Santa Cruz, San Bernardino and Los Angeles, that operated as charter counties and did not make reports to this office. The following counties, Trinity, Sierra, Alpine, Mono and Inyo, do not have a traffic force. In the 49 counties reporting there are 264 captains and patrolmen and 25 clerks.

REGISTRATION

Relative to the activities of the Division in connection with registrations ending August 31, 1929, there are 1,929,496 fee paid registrations and 33,838 exempt registrations, or a total of 1,963,334. The total fees collected are \$9,570,205.93. The Division has issued 50,917 nonresident permits.

STATE HIGHWAY WORK OVER STATE

ALPINE COUNTY

The highway between Markleeville and Woodfords is being widened and surfaced. The Camino Construction Company is doing the widening. State forces are doing the surfacing.

AMADOR COUNTY

J. P. Holland's contract for grading 2.7 miles between Dry Town and Amador City, a portion of the Mother Lode Highway in Amador County, is practically complete. A contract has been awarded to Hemstreet & Bell for rock surfacing this job. This work will start shortly.

The Mother Lode Highway between Plymouth and Cosumnes River will soon be reconstructed practically throughout. J. P. Holland has the contract on the final portion.

BUTTE COUNTY

Work is progressing favorably on the contract between Oroville and Feather River, a distance of 4.4 miles, Ariss-Knapp Company, Contractor. This is the first unit of the Oroville-Quincy highway which, when completed, will be one of the most scenic roads in the state highway system, and which will make a large

mountain region easily accessible to tourists, hunters and fishermen.

Camp No. 17, located on the Feather River about 8 miles above Oroville, is at present manned by 119 convicts and 19 free men. The project on which the camp forces are engaged is another unit of the Feather River Highway between Quincy and Oroville and will be available for local traffic as soon as the bridge across the Feather River at the westerly end of the unit and the grading unit under construction by the Ariss-Knapp Company, between that point and Oroville, are completed. Approximately $3\frac{1}{2}$ miles of this unit have been completed. The work is of a very rugged, rocky nature, but progress is very satisfactory.

CALAVERAS COUNTY

The grading job between Mokelumne Hill and San Andreas has just been completed by the Gabler Construction Company. This contract is on the Mother Lode Highway and eliminates the worst section of the road between the above towns. Bids will be opened September 30th for surfacing this stretch with gravel.

The new road at Black Springs on the Big Trees Highway will soon be completed. This construction is being handled by Superintendent J. H. Gates and will eliminate the old grade to Black Springs.

COLUSA COUNTY

The plans and estimates for constructing 15.6 miles of highway from Abbott Mine, Lake County, to Salt Creek Canyon, part of the Ukiah-Tahoe Highway, have been completed, and provide for a 24-foot roadbed. It is anticipated that the work as far as Bear Creek will be done by convict labor forces continuing the work done in Lake County by the same labor forces.

A contract has been awarded to J. E. Johnston for placing bituminous macadam surfacing on existing pavement and constructing rock borders on each side of the existing pavement between Geneva (Berlin) and a point 2.6 miles northerly. Work will be started soon.

DEL NORTE COUNTY

The Holdener Construction Company, who have the contract for oil surfacing 35 miles of Redwood Highway from the Oregon Line to the new Hiouchi Bridge over Smith River, have practically completed the work.

The Holdener Construction Company also have the contract for producing and stock piling approximately 5700 cubic yards of crushed rock for a light bituminous surface over the 22 miles of the Roosevelt Highway in Del Norte County, between Crescent City and the Oregon Line. The rock produced under the contract is being used by state forces in placing the bituminous surfacing. There is approximately 3 miles more to be completed.

The Webber Construction Company have the contract for constructing a small, two-span concrete girder bridge over Hardscabble Creek, approximately 6.68 miles east of the Hiouchi Bridge over Smith River. The work is practically complete and it is expected that the new bridge will be in use in the near future.

The Webber Construction Company have completed the placing of additional crushed rock surfacing over 4 miles of highway between a point 5 miles east of Crescent City and the new Hiouchi Bridge over Smith River, on the Redwood Highway. They have also stock piled sufficient crushed rock for placing a 2-inch by 20-foot bituminous macadam surface over the entire 4 miles.

J. C. Compton of McMinnville, Oregon, is the contractor for placing the 2-inch by 20-foot bituminous macadam over the above named section and the work is now in progress, approximately one mile of the macadam being completed.

J. E. Johnston, who has the contract for grading and surfacing the Redwood Highway between Klamath River and Wilson Creek, has practically completed all the grading and surfacing work and the road is open to public travel throughout. He is now completing the necessary protection work along the ocean shore, near the northerly end of his contract. It is expected that the contractor will have this work completed in the very near future.

J. E. Johnston also has the contract for grading and surfacing between the southerly Del Norte County Line and the Head of Richardson Creek, a point 2 miles south of Klamath River. The work has been completed except for the completion of a small amount of drainage work.

The Webber Construction Company is stock piling rock at the Head of Richardson Creek, 2 miles south of Klamath River, for reinforcing the base between the Head of Richardson Creek and Klamath River. It is expected that this rock will be placed during the late fall.

EL DORADO COUNTY

Grading of 5.1 miles of the Lincoln Highway along the south shore of Lake Tahoe (Mays Station to the Nevada State line) is being done by L. W. Hesse, Contractor. The road will be constructed 36 feet wide with no sharp curves nor steep grades. Contract is progressing satisfactorily and will be completed before winter.

From Folsom to Placerville, construction of oil-treated rock borders is in progress and is scheduled for completion December 7, 1929. The improvement is designed to correct the present narrow pavement and extremely sharp curves by placing the 3-foot rock borders which will give a paved 18-foot traveled way, and will render this portion more capable of traffic demands to which this route is subject. Further improvement will be gained by superelevating curves with oil-treated material and constructing additional width on the inside of curves to effect alignment correction where possible. This contract was awarded to W. H. Larson and is financed from the State Highway Maintenance Fund.

Between Riverton and Kyburz on Route 11 the grading of 5.75 miles is in progress. As a Forest Highway, this is a cooperative project to which \$140,000 was subscribed as the state's share. This contract was awarded to G. E. Finnell and is under the supervision of federal engineers.

Between one mile north of Eagle Falls and three miles south of Meeks Bay, state forces are improving drainage conditions and placing disintegrated granite surfacing. The work is well under way and will be completed soon.

HUMBOLDT COUNTY

The Webber Construction Company received the contract for producing and stock piling bituminous macadam rock along the Redwood Highway for a 20-foot by 2-foot bituminous macadam between a point one mile south of Orick and the northerly Humboldt County Line. The rock as yet produced is not sufficient to permit the starting of the placing of the macadam surfacing, but it is expected that the rock will be out in time for the contractor to place the macadam surfacing during the late spring of next year.

The Engelhart Paving and Construction Company have a contract for placing additional surfacing and stock piling rock for bituminous macadam pavement on approximately 3.3 miles of the Redwood Highway between Big Lagoon and Orick. The stock piling of the bituminous macadam rock is practically complete and the surfacing is under way.

Kern & Kibbe have the contract for placing additional crushed rock surfacing over 4.3 miles of the Redwood Highway from Trinidad southerly to Little River and for stock piling rock for bituminous macadam pavement over the same distance. The surfacing has been completed and the stock piling of the macadam rock is approximately one-third complete.

W. C. Elsemore has completed approximately one-third of his contract for producing crushed rock for bituminous macadam pavement between Mill Creek and Little River, a distance of 6.4 miles.

Heafey-Moore Co. of Oakland have the contract for placing the bituminous macadam over the entire roadway between Mill Creek and Trinidad, a distance of 10.7 miles. The work is well under way for placing the macadam between Mill Creek and Little River. It is expected that this work will continue until wet weather forces a shut-down.

The reconstruction of the highway between Mad River and Mill Creek, 0.9 mile, by Ellison & Smith, Contractors, is approximately 85 per cent complete and it is expected that traffic will be carried over the new work before winter rains set in.

Contractors Kennedy & Bayles have made splendid progress on their contract for grading and surfacing the Redwood Highway between Arcata and Mad River and it is expected that their work will be complete around the last of September.

The Butte Construction Company, who have the contract for the construction of the new bridge over Mad River, have made good progress and the steel work is now being placed. It is expected that the new bridge will be ready to carry the next season's tourist traffic.

The construction of the overhead crossing of the highway over the Northwestern Pacific Railroad and the Arcata and Mad River Railroad, approximately one mile north of Arcata, is well under way by the Mercer-Fraser Company of Eureka.

The completion of the last four named contracts is expected in time to permit traffic over the entire distance between Arcata and Mill Creek, by early next spring.

The grading of the new highway between Loleta and a point approximately $7\frac{1}{2}$ miles south of Eureka, a distance of 7.3 miles, is under contract to E. C. Coats of Sacramento. The grading work is approximately two-thirds complete but it is doubtful whether the entire job will be completed before winter rains set in.

Bids are to be received on October 9, for the grading of a 28-foot standard roadway and surfacing with

8-foot by 20-foot of crushed rock surfacing, that portion of the highway between Fish Creek Grove and Stephens Grove, a distance of 3.2 miles. The improvement of this section will eliminate another very crooked piece of the Redwood Highway.

INYO COUNTY

From the southerly boundary to Little Lake, a distance of 9.8 miles, Fred W. Nighbert has a contract for grading and oil-treated surfacing. Work is well under way on this contract. Resident Engineer B. M. Gallagher is in charge of this work.

Grading and placing of oil-treated surfacing between Little Lake and Coso Junction, a distance of 3.7 miles is now being advertised.

Plans have been prepared and submitted for grading and placing of oil-treated surfacing from Coso Junction to Olancho, approximately 21.8 miles. This work will be advertised soon.

From Olancho to the northerly boundary an excellent oil-treated surface is in place. The portion from Cottonwood Creek to Diaz Lake, a distance of 10.3 miles, was completed September 7th by G. W. Ellis, who had the contract. H. M. Hansen was resident engineer in charge of this work.

Oil-treating of shoulders between Bishop and Mono County line is now in progress by maintenance forces under the direction of Dwight Wonacott, foreman.

KERN COUNTY

From Mojave to the northerly boundary of Kern County several constructive operations for improvements are under way and completed.

On that portion of the highway, between Mojave and Cinco, a distance of approximately 17.2 miles, grading and oil-treated surfacing has been completed on two contracts. Between Mojave to 7 miles south of Cinco, a distance of 9.9 miles, work was completed by the contractors, Bartlett and Mathews. The resident engineer was S. C. Risley. Between 7 miles south of Cinco and Cinco, a distance of 7.3 miles, the work was completed by the Southwest Paving Company. The resident engineer was W. Mathews.

Plans are nearly complete for grading and placing of an oil-treated surface from Cinco to 7 miles north of Ricardo, a distance of approximately 16 miles, through the scenic Red Rock Canyon.

From this point on to the northerly boundary of the county there are two other contracts under way, approximately 24.1 miles. From 7 miles north of Ricardo to Freeman a distance of 10.2 miles, G. W. Ellis is contractor, and from Freeman to the northerly boundary, a distance of 13.9 miles, Bartlett & Mathews and Black & Hagey are the contractors. V. E. Pearson is the resident engineer in charge of this work.

LAKE COUNTY

The grading of the Ukiah-Tahoe road between Clear Lake Oaks and Sweet Hollow Summit has been completed by convict labor forces. From the Summit to Abbott Mine the 20-foot graded roadbed is being widened to 24 feet.

Hemstreet and Bell have recently contracted to place a 20-foot crushed rock and oil mix surface from High Valley Creek to Abbott Mine, about 15.6 miles. This work is programmed for completion January 27, 1930 and to date is about 65 per cent complete.

Construction of a graded road to be surfaced with oil-treated crushed gravel or stone is under way between Lucerne and Clear Lake Oaks. The work is being performed under contract by von der Hellen, Pierson and Logan. This project is scheduled for completion November 12, 1929 and it is now approximately 80 per cent complete.

LASSEN COUNTY

Construction is now in progress on a 4-mile unit between Goodrich and Coppervale, a short distance east of Westwood, which will complete a short gap that has been in existence for several years. Work is being rushed as much as possible in order to beat the snow season. Doveri & Company & J. A. Maddox of Klamath Falls, Oregon, are contractors on this project, Contract 02TC4.

Hein Brothers and Chittenden are getting away to a good start on the resurfacing project between Susanville and Milford in Lassen County, a distance of 19.4 miles, Contract 22LC2. It is probable that work on this project will go into the winter, but it is of such a nature that cold weather will not seriously affect the progress.

Contract 02CN1, covering the grading and construction of culverts on 5 miles of highway across Long Valley in Lassen County south of Doyle, is under construction. The contractor on this project is Meyer Rosenberg of San Francisco. This is Mr. Rosenberg's first highway contract, but he is rushing the work to completion and will be well out of the way before winter. The construction of this project will eliminate 7 grade crossings over the Western Pacific Railroad between Doyle and Constantia.

LOS ANGELES COUNTY

A line change immediately north of the Newhall Tunnel has been surveyed, and the work is now being advertised for bids. This change eliminates some very bad curves, and it is expected construction will be under way this fall.

Work on paving crescent-shaped areas on the Ridge Route with bituminous macadam is being done by Gibbons & Reed, contractors. These areas were left unpaved when alignment on this route was straightened by the state day labor forces. Emulsified asphalt is being used in this work.

Rapid progress is being made in the work of grading the Newhall Alternate Line between Tunnel Station and the Santa Clara River. LeTourneau and Lindberg are the contractors. It consists of grading a 46-foot roadbed, 8.6 miles long, and eliminates from this route the Newhall Tunnel and several dangerous curves in the vicinity of Newhall and Saugus. It is expected this work will be completed about December 1st.

A contract on the Foothill Boulevard, between Glendora and Claremont, is rapidly nearing completion. This consists of 5.5 miles of asphaltic concrete pavement, 30 feet by 6 inches. The Griffith Company is the contractor.

The first contract on the La Canada-Mt. Wilson Highway for grading 2.6 miles of 40-foot roadbed was

awarded to H. W. Rohl Company on August 14th. Grading work is in progress.

MENDOCINO COUNTY

State forces are widening and straightening the roadway between the sidehill viaduct about 4 miles north of Lane's Redwood Flat and Red Mountain Creek. When this portion of narrow road along the steep bluffs of the South Fork of Eel River is completed, the last very narrow section of the Redwood Highway will have been eliminated. The road is being graded to a 24-foot standard roadway width and surfaced with 8 inches of crushed rock surfacing.

MONO COUNTY

At Hilton Creek, 1.57 miles of grading by D. C. Follis is nearing completion. Between Magee Creek and Convict Creek, approximately 3 miles of grading and crushed rock surfacing is well under way by Montfort & Armstrong, contractors. Walter Mathews is resident engineer in charge of this work.

Between Mattly Ranch and Leevining Creek there is 2.18 miles of grading and oiled macadam surface. C. Miles, the contractor on this work is making rapid progress. Kenneth Peirce, is assistant resident engineer in charge of this work for the state.

A portion of Route 23, in the Walker River Canyon, near Coleville, has been completed by day labor forces, under the supervision of Paul Peak, Foreman.

A one and one-half yard Northwest shovel is busy widening and straightening the Sonora Pass Road, between Sonora Junction and the Pass. The work is being done with Minor Improvement and Betterment Funds, under the supervision of Paul Peak, Foreman, with maintenance forces.

Widening and straightening of the narrow places on the Tioga Road; Road IX-Mno-40-A, is now moving along satisfactorily with state forces, under the direction of Ray Flynn, Foreman.

Standard guard rails are being placed on Dogtown and Conway grades, under the supervision of Joe Penrose.

Approximately one thousand feet of rail has just been completed on Sherwin Hill and Rock Creek grades by Mr. Penrose.

MONTEREY COUNTY

Work is in progress on the reconstruction of the Coast Highway between Chualar and Salinas, a distance of 10.3 miles. This work involves grading a 36-foot road bed and placing a 20-foot asphaltic concrete, second-story pavement. The Peninsula Paving Company of San Francisco is the contractor. Within the limits of this project, at Spence there will be a change of line and an underpass of the Southern Pacific tracks. Bids have been received on this work with Triberti-Massaro submitting the low bid. The underpass and approach will be under the supervision of the Bridge Department.

A new bridge across the Salinas River, at San Ardo is under construction by Contractor, Ben C. Gerwich. This work is under supervision of the Bridge Department. Bids are being received on grading and paving with Portland cement concrete, a

change of line, 1.5 miles in length including the approaches to this bridge.

Plans are complete for a change of line at the crossing of the Coast Highway over the Salinas River at Bradley and the Bridge Department is preparing plans for a new bridge.

On the San Simeon-Carmel Highway across the Little Sur River, a new bridge consisting of one 50-foot deck truss span and 14 19-foot timber spans is under construction by Lord and Bishop, Contractors.

Construction of oiled rock shoulders has been under way by state forces over a considerable portion of the Coast Highway where the width of paving is only 15 feet and has increased the safety of travel over these portions materially.

NEVADA COUNTY

Grading of a state highway by the Callahan Construction Company has been resumed between Indian Springs and Soda Springs near the summit of the Colfax-Truckee road. Travel is being maintained through the construction with little inconvenience. On account of the many difficulties encountered on this work, it is doubtful whether this work will be completed this year.

C. R. Adams was awarded the contract for grading and surfacing 11.7 miles between Nevada City and Washington Road, and this work is well under way. This section, consistent with the rest of the Ukiah-Tahoe Highway, will consist of a 24-foot roadbed. An oil-mixed crushed rock surface, 20 feet wide, is to be placed by the terms of the contract. This project is programmed for completion in April, 1930.

NEVADA AND PLACER COUNTIES

Improvement is under way between Roseville and one-half mile north of Andora Subway. The work is being done by J. E. Johnston and consists of placing bituminous macadam surfacing on the existing pavement and constructing rock borders.

Between Airport and Indian Springs on Route 37, 9.3 miles of grading is in progress. This project covers the construction of a 28-foot roadbed and was awarded to T. E. Connolly. Construction will be completed November, 1930.

A contract has been awarded to Meyer Rosenberg for placing 6.9 miles of bituminous surface treatment, 20 feet wide, between Soda Springs and Donner Lake. This work has been suspended as the temperature does not permit oiling.

ORANGE COUNTY

The contract for a line change 0.7 of a mile in length between Serra and San Juan Capistrano was awarded to Matich Bros. on August 12th. This work consists of a 40-foot graded roadbed with Portland cement concrete pavement, 20 feet by 7 inches. Grading and culvert work is now under way.

A contract for a line change to connect up the overhead crossing of the A. T. & S. F. Railway at Irvine is in progress. This consists of grading 0.7 of a mile and paving with Portland cement concrete 30 feet wide. This contract is approximately two-thirds complete. Steele Finley is the contractor.

A contract for paving one-half width between Santa Ana and Anaheim was awarded on June 11th to Griffith Company. This section is 4.9 miles long. The paving work is being done in cooperation with Orange County, the state paying for a strip of pavement 28 feet by 7 inches and the county paying for a like amount. Normal progress is being made and it is expected that this contract will be finished next April.

PLUMAS COUNTY

On the Harlowe job, a 6½-mile project south of Chester in Plumas County, work is nearing completion. This job has been carried through two seasons, but it is expected that it will be ready for acceptance within the next three or four weeks and will be ready for traffic in time for the opening of the U. S. Bureau of Public Roads job between Morgan Springs and the county line in Tehama County. These two units will eliminate the high climb over the Feather River Summit on the existing county road and will pass through country in the Lassen National Forest, equally as interesting as that which the old road passes through.

Camp No. 16, located near Paxton, is manned by 122 convicts and 30 free men. The major grading equipment consists of two gasoline power shovels. Of the 7½ miles on this project, approximately 5 miles have been completed to date, and it is anticipated that the work will be completed early in 1930. In addition to the grading work, the camp forces are constructing a two-span wooden truss bridge across Indian Creek. The bridge will be completed in two or three weeks. This unit is a part of the Feather River Highway between Quincy and Oroville, which will undoubtedly prove a very heavily traveled road when completed.

SACRAMENTO COUNTY

Fredrickson-Watson Construction Company & Fredrickson Brothers were awarded the construction of 8.7 miles of Portland cement concrete pavement on the Sacramento-Roseville road between Ben Ali and Sylvan School. This project is progressing satisfactorily and will be completed, in all probability, within the allotted time. The time for completion is set as January, 1930. This contract is being constructed according to the latest standards and methods of Portland cement concrete pavement.

Larsen Brothers contract for grading and surfacing between Arno and McConnell on the highway between Sacramento and Stockton is well under way. This job will eliminate the dilapidated narrow trestle and road here.

SAN BENITO COUNTY

On the Coast Highway at intervals between a point 7 miles north of Salinas and San Juan Bautista, a 1½-inch bituminous macadam surface 16 feet wide is being placed by W. A. Dontanville, Contractor. A total of 2.4 miles of surface is being placed, which work started on September 13th and should be completed about the middle of October. This surfacing is being placed on those portions of the road where the present paving is badly cracked, including portions of the San Juan Grade.

SAN DIEGO COUNTY

A contract was awarded September 10, 1929, to the R. E. Hazard Contracting Co. of San Diego for constructing oil rock borders on portions of the Coast Route between the city limits of San Diego and Oceanside. Work will be started at an early date.

A contract for grading the Rose Canyon road between Balboa avenue and Torrey Pines Road was awarded on August 13th to the R. E. Hazard Contracting Company. This section is 5.4 miles long and is to be a 46-foot graded roadbed. Work is just starting on this contract.

The contract for grading a roadbed 36 feet wide and placing of Portland cement concrete pavement 20 feet by 7 inches is in progress between Pine Valley and Kitchen Creek on the San Diego-El Centro Highway. It is expected that this section will be completed by the end of the year.

A contract for 4.5 miles of 38-foot graded roadbed between La Posta Creek and Miller Creek on the San Diego-El Centro Highway was awarded on May 27th to the Nevada Contracting Company. Grading is in progress for a distance of about two miles.

A contract for grading 3.9 miles of 36-foot roadbed from Kitchen Creek to La Posta and paving with 20 feet by 7 inches Portland cement concrete was awarded on June 25th to Basich Bros. About one mile of rough grading is completed, and grading is now in progress on about one-half mile. This section is on the San Diego-El Centro Highway.

SAN JOAQUIN COUNTY

We have two contracts under way in San Joaquin County. The one between Mossdale and Banta, C. W. Wood, Contractor, for grading and cement concrete paving 3.1 miles, is progressing satisfactorily. This is on the highway between Stockton and Tracy, the main road to Oakland. The other is for grading and surfacing two line changes on the Hogan Road between Stockton and Manteca—the main highway between Stockton and Los Angeles. Lilly, Willard & Biasotti are the contractors. The work is well under way.

Eight-foot rock shoulders are being placed from Banta to the Alameda County line to make the highway safer for traffic, especially during the winter months.

SAN LUIS OBISPO COUNTY

Work has been completed on grading and paving with 20-foot and 30-foot width of Portland cement concrete pavement from Pismo to Arroyo Grande. Through the town of Pismo, street improvements have been extended the full width of the street by a local improvement district and conforms with other work being done in Pismo. Cornwall Construction Company was the contractor on both the 30-foot width of paving by the state through the town of Pismo and also on the Improvement District work.

On the Coast Highway between Cuesta and 1½ miles south of Santa Margarita, 1.9 miles of grading and paving is being constructed by Mr. M. J. Bevanda, Contractor. This work will improve the alignment and provide a 20-foot concrete pavement at the north end of Cuesta Grade.

Work is being started by Mr. Bevanda on a change of line and the construction of a timber bridge over Yerba Buena Creek just north of Santa Margarita. This work will correct a dangerous curve that has been the scene of several accidents.

Contract has been awarded to Steel Finley of Santa Ana for the reconstruction of the Coast Highway with a 36-foot roadbed and 20-foot asphaltic concrete pavement for a distance of 9.6 miles, between Atascadero and Paso Robles. This work will correct the alignment and grade at many places and in the vicinity of Graves Creek and Paso Robles Creek major line changes will be made. The new alignment will use the existing structure over Paso Robles Creek but a new structure will be required across Graves Creek. The contract for this bridge has been awarded to William Lane of Paso Robles and is under the supervision of the Bridge Department.

Through the town of Atascadero, a local improvement district will complete the street improvement for the full width of the right of way.

On the Cholame Lateral between a point 1.7 miles west of Shanden to the San Luis Obispo-Kern County line, regrading and placing a 20-foot bituminous macadam surface has been completed by A. Teichert and Son. Similar construction work is in progress by the same contractor from the west end of the first project to the Estrella River, a distance of about 6 miles. Material for this work is produced from a local quarry developed by the contractor.

Just north of Cambria on the San Simeon road, Route 56, 0.9 mile of grading to a 30-foot roadbed width and gravel surfacing 20 feet wide is being constructed by Tiffany, McReynolds, Tiffany of San Jose. This replaces a portion of county-built road between Cambria Pines Subdivision.

Surveys have been completed and plans are being prepared for the reconstruction of the Coast Highway from the Santa Maria River to Los Berros Creek, a distance of 7.4 miles.

SANTA BARBARA COUNTY

Work is nearing completion by McCray Co. of Los Angeles on a change of line over Rincon Hill between Benham and Carpinteria on the Coast Highway. This project involves grading a 46-foot roadbed and constructing a Portland cement concrete pavement 30 feet in width. A new steel and concrete bridge is nearly complete across the Southern Pacific tracks within the limits of this line change on which Paul M. White is contractor.

Work has been completed by Sam Hunter on the grading of a 36-foot roadbed and the placing of a 20-foot second-story asphaltic concrete pavement on 3.5 miles of the Coast Highway near Ellwood.

M. J. Bevanda, Contractor, has completed the placing of bituminous macadam surface 1½-inch by 20-foot on 2.4 miles of the Coast Highway between Los Alamos and 6½ miles north, which will eliminate some very rough old concrete pavement.

SHASTA AND TRINITY COUNTIES

A. Milne, Contractor, is now making rapid strides on Contract 02TC3 in Shasta and Trinity counties, which provides for the surfacing of portions of new highway and the resurfacing of portions of old highway amounting, in all, to 17 miles of work. Work progressed very slowly at first due to the high per-

centage of waste encountered in the gravel bars in Weaver Creek where the plant was first set up. However, a new source of rock was obtained and an additional plant has been set up on the Shasta County end, and work is now progressing rapidly.

Camp No. 12, which is located at Shingle Shanty in Trinity County, manned by 133 convicts and 28 free men, is constructing a new graded roadway on 19.24 miles in Trinity and Shasta counties. The grading is being handled by two gasoline power shovels and by the use of swede traps and tunnels, and work is progressing very satisfactorily. Due to the extreme heavy character of the work on these projects, this camp will be engaged on this work about one year more. The completion will provide a continuous improved highway between Redding and Weaverville and will cut down the present running time between the two points approximately one hour.

Camp No. 20, located about 8 miles east of Ingot on the Redding-Alturas lateral, has been operating about one month and is just getting a good start on the 13-mile unit. The equipment on this work consists of one gasoline power shovel, and the forces consist of 52 convicts and 12 free men. The project is located in the Cow Creek and Cedar Creek canyons in Shasta County, and the work will result in a very decided improvement, as the existing road is rather narrow and crooked.

SISKIYOU COUNTY

A contract is now in progress in Siskiyou County between Shasta River and Gazelle. This contract consists of the reconstruction of the old roadbed and the placing of a concrete pavement 20 feet in width on 7.7 miles of highway. Work is progressing very favorably at present, and it is expected that the new pavement will be in use before the winter rains set in. The contractor is producing his own aggregates from sources on the job and while he experienced some difficulty at the start in obtaining fine aggregate, adjustments in his plant and blends of the local sand have produced a material which will give very satisfactory results. The T. M. Morgan Paving Company of Los Angeles is doing the work.

A contract has just been awarded to the Mathews Construction Company for the paving of 0.65 miles of reconstructed highway at Spring Hill just north of Mt. Shasta City. The contractor is now assembling his equipment preparatory to getting on to the ground. The grading on this reconstruction was recently completed by Young Brothers and involved the moving of the Southern Pacific Company's tracks and the grading of 0.65 miles of highway, eliminating a very dangerous 200-foot radius curve at the foot of a steep grade. It is anticipated that the paving work will be completed well in advance of winter weather.

SOLANO COUNTY

A serious traffic hazard is now removed by the near completion of the grading and surfacing with bituminous macadam of the highway through Jamison Canyon between Napa County and Cordelia. This job also involved the moving of several miles of pipe line which supplies the city of Vallejo.

State forces under Superintendent G. E. Marshall are placing an oil macadam wearing surface over the new line change at Cordelia.

STANISLAUS COUNTY

The asphaltic surface between Turlock and Keyes is being honed to reduce roughness in the pavement.

TUOLUMNE COUNTY

A grading job 1.6 miles long on the Mother Lode Highway, now completed, gives a much improved entrance to Sonora, "Queen of the Southern Mines." This road connects the old road with the Columbia-Sonora Road already paved with asphalt concrete several years ago. Noble Brothers are the contractors. A contract for surfacing this job will be advertised in the near future.

Another job in the same vicinity is nearing completion. This is the Lilly, Willard & Biasotti contract for the grading and surfacing with oil rock premix of 1.6 miles on the Sonora-Mono Road just east of Sonora.

Work will soon be completed on the new line change near the top of the Sonora Pass, which will eliminate the third and fourth crossings of Deadman's Creek. Last year a change was made which eliminated the first and second crossings of this treacherous creek. Superintendent Ed Harris is in charge of the work.

YOLO COUNTY

Plans and estimates have been made and the state is preparing to proceed with the improvement of Mullen Crossing of the Southern Pacific Railroad, south of Woodland. The work to be done consists of grading and paving with Portland cement concrete pavement on line change to eliminate the present jagged and rough crossing. Neon tube railroad crossing signs will be installed over the road on each side of the crossing.

The state highway between Bretona and Dunningan will be improved soon under contract by J. E. Johnston. The work will consist of placing bituminous surfacing on existing pavement and constructing rock borders.

YUBA COUNTY

The state highway between Dry Creek and Morrison's Crossing is to be improved by placing bituminous macadam surfacing on the existing pavement and constructing rock borders on each side of the pavement. The work will be done under contract by J. E. Johnston.

The dull boy in the class unexpectedly distinguished himself in a recent examination when, in replying to the question, "How and where was slavery introduced into America?" he wrote:

"No women had come over to the early Virginia colony. The planters wanted wives to help with the work. In 1619 the London Co. sent over a shipload of girls. The planters gladly married them and slavery was introduced into America."—*The Pathfinder*.

Record of Bids and Awards

HIGHWAY BID OPENINGS FROM JULY 31 TO SEPTEMBER 25

AMADOR COUNTY—Between Drytown and Amador City, 2.7 miles to be surfaced with untreated crushed gravel or stone. Dist. X, Rt. 65, Sec. B. A. J. Grier, Oakland, \$27,410; Tieslau Bros, Berkeley, \$30,835. Contract awarded to Hemstreet & Bell, Marysville, \$27,075.

DEL NORTE COUNTY—Between Smith River and Oregon line, 35.5 miles of producing and stockpiling screenings. Dist. I, Rt. 1, Secs. C D and E. Smith Bros., Eureka, \$34,680. Contract awarded to Holdener Construction Company, Inc., Sacramento, \$33,048.

EL DORADO COUNTY—Between Bay View Rest and 1 mile north of Eagle Falls, 1.8 miles to be graded. Dist. III, Rt. 38, Sec. B. J. M. De Luca, Oakland, \$186,738; Robert Heaney, Hayward, \$181,123.70. Contract awarded to Nate Lovelace, Sacramento, \$179,936.

LOS ANGELES COUNTY—0.8 of a mile north of Sandberg's to 2.5 miles north of Sandberg's, to be surfaced with bituminous macadam. Dist. VII, Rt. 4, Sec. 4. Contract awarded to Gibbons & Reed, Burbank, \$13,352.

MADERA COUNTY—Between Califa and northerly boundary, 5.6 miles to be graded and paved with asphaltic concrete. Dist. VI, Rt. 4, Sec. C. Force, Currihan & McLeod, Oakland, \$153,884; Hanrahan Co., San Francisco, \$144,747.50; Valley Paving & Const. Co., Visalia, \$153,940. Contract awarded to A. Teichert & Son, Sacramento, \$135,636.10.

MARIN COUNTY—Between Gallinas Creek and San Rafael, 1.8 miles to be graded and paved with Portland cement concrete and bituminous macadam. Dist. IV, Rt. 1, Sec. A. W. H. Hauser, Oakland, \$162,774; Hanrahan Company, San Francisco, \$175,558; C. T. Malcom, Walnut Creek, \$174,359; D. McDonald, Sacramento, \$178,538; Isbell Construction Co., Fresno, \$198,593; M. J. Bevanda, Stockton, \$227,185; Fredrickson & Watson Const. Co., Oakland, \$173,875; J. P. Holland, Inc., San Francisco, \$156,243; E. C. Coats, Sacramento, \$175,575. Contract awarded to Granfield, Farrar & Carlin, San Francisco, \$133,231.75.

MONTEREY COUNTY—Near Spence, and under-grade crossing under the S. P. R. Co. tracks. Dist. V, Rt. 2, Sec. B. C. C. Gildersleeve, Felton, \$26,585; McDonald & Maggiora, Sausalito, \$30,332; Ward Engineering Co., San Francisco, \$37,238; MacDonald & Kahn, Inc., San Francisco, \$32,449; Fredrickson Bros. Const. Co., Oakland, \$31,087; Otto Parlier, Tulare, \$26,087; Pan. Pac. Piling & Const. Co., Los Angeles, \$34,639; Healy-Tibbitts Const. Co., San Francisco, \$25,440; C. Dudley De Velbiss, Oakland, \$31,573; Arthur J. Greer, Oakland, \$31,652. Contract awarded to Triberto-Massaro Co., Oakland, \$24,555.50.

ORANGE COUNTY—Westerly of San Clemente, about 0.2 of a mile to be graded and paved with Portland cement concrete. Dist. VII, Rt. 2, Sec. A. Contract awarded to Match Bros., Elsinore, \$8,872.75.

SAN BERNARDINO COUNTY—Between 2 miles west of Argos and 1½ miles west of Siberia, 19.5 miles to be graded and surfaced with oil-treated crushed gravel. Dist. VIII, Rt. 58, Secs. H and J. Allied

Contractors, Inc., Omaha, Neb., \$408,799; George Herz & Co., San Bernardino, \$350,396; V. R. Dennis Construction Co., San Diego, \$408,629; Maceo Construction Co., Clearwater, \$411,433; Hodgman & Macycar, Pasadena, \$436,426. Contract awarded to New Mexico Construction Co., Denver, Colo., \$368,022.10.

SAN DIEGO COUNTY—Between San Diego and Oceanside, 3 miles to be widened with bituminous macadam borders. Dist. VII, Rt. 2, Secs. A and B. Butterfield Const. Co., San Diego, \$35,630; Matich Bros., Elsinore, \$35,850; Watson & Sutton, San Diego, \$36,025. Contract awarded to R. E. Hazard Contracting Co., San Diego, \$33,686.

SAN LUIS OBISPO COUNTY—Between Atascadero and Paso Robles, 9.6 miles to be graded and paved with asphaltic concrete. Dist. V, Rt. 2, Sec. B. Peninsula Paving Co., San Francisco, \$277,499; Valley Paving & Const. Co., Visalia, \$306,351; George R. Curtis Paving Co., Los Angeles, \$313,283; Sander Pearson, Santa Monica, \$318,846; Cornwall Const. Co., Santa Barbara, \$304,276; Force, Currigan & McLeod, Oakland, \$313,492; Western Roads Co., Oakland, \$288,590; Gibbons & Reed Co., Burbank, \$329,206; A. Teichert & Son, Inc., Sacramento, \$303,839; M. J. Bevanda, Stockton, \$287,053; Hanrahan Company, San Francisco, \$327,624. Contract awarded to Steele Finley, Santa Ana, \$268,258.50.

SISKIYOU COUNTY—Steel deck truss bridge across Shasta River, about 6 miles north of Yreka. Dist. II, Rt. 3, Sec. C. Gutleben Bros., Oakland, \$222,619; Butte Construction Co., San Francisco, \$238,045; M. B. McGowan, San Francisco, \$239,863; Northwest Contracting Co., Portland, Ore., \$201,345; Schuler & McDonald, Inc., Oakland, \$246,659; Lynch-Cannon Engr. Co., Los Angeles, \$208,586; Bayly Hipkins, San Francisco, \$217,523; Mercer-Fraser Co., Eureka, \$224,644. Contract awarded to H. E. Doering, Portland, \$190,368.50.

SISKIYOU COUNTY—Near Mt. Shasta about 0.6 of a mile to be paved with Portland cement concrete. Dist. II, Rt. 3, Sec. A. J. E. Johnston, Stockton, \$21,158. Contract awarded to Mathews Const. Co., Sacramento, \$22,648.

SONOMA AND MARIN COUNTIES—Between Petaluma and Ignacio, 11.9 miles to be graded and paved with Portland cement concrete. Dist. IV, Rt. 1, Secs. C and A. J. P. Holland, Inc., San Francisco, \$558,649; Guy F. Atkinson Company, San Francisco, \$633,209; Ward Engineering Co., San Francisco, \$729,036; Fredrickson & Watson, Oakland, \$593,892; M. J. Bevanda, Stockton, \$578,746; J. F. Knapp, Oakland, \$614,686; E. Paul Ford, San Diego, \$540,879; Mercer-Fraser Co., Eureka, \$659,786. Contract awarded to Hanrahan Co., San Francisco, \$536,795.75.

TEHAMA COUNTY—Between Paynes Creek and Morgan Springs, 28.7 miles to be surfaced with untreated crushed gravel or stone. Dist. II, Rt. 29, Secs. B and C. Milne & Dussault, Portland, Ore., \$97,471; Hemstreet & Bell, Marysville, \$100,251. Contract awarded to A. F. Giddings, Sacramento, \$95,757.50.

WATER PERMITS

AND APPLICATIONS

Applications for Permit to Appropriate Water Filed with the State Department of Public Works, Division of Water Resources, During September, 1929.

ALAMEDA COUNTY—Application 6436. Charles Wilton Fay, 4131 Lincoln Ave., Oakland, for 3 c.f.s.

from Mill Creek tributary to Indian Creek to be diverted in Sec. 25, T. 18 N., R. 6 E., M. D. M., for domestic and mining purposes.

BUTTE COUNTY—Application 6448. C. B. Malone, Oroville, for 6000 a.f. per annum from Bosh Creek tributary to Middle Fork Feather River to be diverted in Sec. 8, T. 21 N., R. 6 E., M. D. M., for mining purposes.

DEL NORTE COUNTY—Application 6441. Department of Public Works, Division of Highways, Sacramento, for 0.017 c.f.s. from unnamed spring tributary to Smith River to be diverted in Sec. 29, T. 17 N., R. 2 E., H. M., for domestic purposes. Estimated cost \$850.

DEL NORTE COUNTY—Application 6446. C. J. Dumbolton, Holland, Josephine County, Oregon, for 12 c.f.s. from Althouse Creek (Right Fork) tributary to Illinois River to be diverted in Sec. 32, T. 19 N., R. 6 E., H. M., for mining (hydraulic) purposes. Estimated cost \$1,000.

DEL NORTE COUNTY—Application 6447. F. M. McAuliffe, Nevada Bank Building, San Francisco, for 500 c.f.s. and 300,000 a.f. per annum from South Fork of Smith River tributary to Smith River to be diverted in Sec. 10, T. 16 N., R. 1 E., H. M., for power purposes.

EL DORADO COUNTY—Application 6439. Kelsey Mining Company, 224 Underwood Building, 931 Market St., San Francisco, for 25 c.f.s. from Rock Creek tributary to South Fork of American River to be diverted in Sec. 20, T. 11 N., R. 11 E., M. D. M., for power purposes. Estimated cost \$10,000.

EL DORADO COUNTY—Application 6440. Charles H. Parrott, 135 Carmel Ave., Roseville, for 200 gals. per day from unnamed stream tributary to South Fork American River to be diverted in Sec. 24, T. 11 N., R. 16 E., M. D. M., for domestic purposes. Estimated cost \$200.

INYO COUNTY—Application 6438. C. M. Davenport and Edward Schober, Los Angeles and Bishop, respectively, for 0.5 c.f.s. from (1) unnamed spring and (2) Grape Vine Spring tributary to no stream to be diverted in (1) Sec. 10, T. 21 S., R. 39 E., M. D. M., and (2) Sec. 15, T. 21 S., R. 39 E., M. D. M., for irrigation and domestic purposes on 40 acres in Sec. 4, T. 22 S., R. 39 E., M. D. M. Estimated cost \$5,000 to \$8,000.

KERN COUNTY—Application 6437. F. G. Oddous, 344 S. Alameda St., Los Angeles, for 0.0067 c.f.s. from unnamed spring tributary to no stream to be diverted in Sec. 23, T. 9 N., R. 21 W., S. B. M., for mining purposes.

LOS ANGELES COUNTY—Application 6425. Joseph Argay, Mt. Wilson, for 50 a.f. per annum from Coldwater Canyon Creek tributary to Big Tujunga to be diverted in Sec. 34, T. 3 N., R. 12 W., S. B. M., for mining and domestic purposes. Estimated cost \$2,500.

LOS ANGELES COUNTY—Application 6435. J. Frank Gore, 1832 Santa Monica Blvd., Beverly Hills, for 0.10 c.f.s. from unnamed spring tributary to City Creek to be diverted in Sec. 26, T. 1 N., R. 3 W., S. B. M., for irrigation purposes. Estimated cost \$750.

LOS ANGELES COUNTY—Application 6442. Paul Louis Holtz, Llano, for 0.39 c.f.s. from underground water tributary to no stream to be diverted in Sec. 21, T. 4 N., R. 8 W., S. B. M., for irrigation and domestic purposes. Estimated cost \$4,000.

LOS ANGELES COUNTY—Application 6438. William H. Heise, care John C. Packard, attorney, Chester Williams Building, 215 W. 5th St., Los Angeles, for 12 c.f.s. from Big Rock Creek to be diverted in Secs. 6 and 8, T. 4 N., R. 9 W., S. B. M., for domestic and irrigation purposes.

MENDOCINO COUNTY—Application 6426. Neil G. Mackinnon, Cummings, for 2 c.f.s. from Big Dan Creek tributary to South Fork Eel River to be diverted in Sec. 12, T. 23 N., R. 17 W., M. D. M., for irrigation and domestic purposes on 16 acres. Estimated cost \$1,200.

PLACER AND NEVADA COUNTIES—Application 6443. Bear River Water and Power Co., care J. L. Rollins, Colfax, for 100,000 a.f. per annum from Bear River and its tributaries tributary to Feather River to be diverted in Sec. 22, T. 15 N., R. 9 E., M. D. M., and Sec. 27, T. 15 N., R. 9 E., M. D. M., for power purposes. Water is available at lower levels for additional power for agricultural purposes and for domestic use. Estimated cost \$2,000,000 to \$2,500,000.

SACRAMENTO COUNTY—Application 6431. V. A. Palmer, 2800 Second Ave., Sacramento, for 200 gals. per day from unnamed stream tributary to South Fork

of American River to be diverted in Sec. 24, T. 11 N., R. 16 E., M. D. M., for domestic purposes. Estimated cost \$200.

SACRAMENTO COUNTY—Application 6434. Golda G. Whipple, Rt. 6, 4540, Sacramento, for 0.31 c.f.s. from Dry Creek tributary to Sacramento River, to be diverted in Sec. 32, T. 10 N., R. 5 E., M. D. M., for irrigation purposes.

SAN DIEGO COUNTY—Application 6445. Harold S. Kibbey, Lakeside, for 0.05 c.f.s. from unnamed spring tributary to San Vicente Creek watershed to be diverted in Sec. 5, T. 15 S., R. 1 E., S. B. M., for domestic irrigation and stock watering purposes. Estimated cost \$1,000.

SAN JOAQUIN COUNTY—Application 6430. C. B. Orvis, Stockton, for 12.0 c.f.s. from State Canal tributary to South Fork of Mokelumne River to be diverted in Sec. 15, T. 4 N., R. 5 E., M. D. M., for agricultural purposes. Estimated cost \$6,500.

SAN JOAQUIN COUNTY—Application 6432. R. G. Houston and Raymond W. Miller, Linden, for 100,000 a.f. per annum from Calaveras River tributary to San Joaquin River to be diverted in Sec. 31, T. 4 N., R. 11 E., M. D. M., for irrigation and domestic purposes.

SIERRA COUNTY—Application 6433. J. B. Harris, care R. E. Taylor, Downieville, for 0.125 c.f.s. from 2 unnamed springs tributary to Goodyear Creek and North Fork Yuba River to be diverted in Sec. 32, T. 20 N., R. 10 E., M. D. M., for power purposes. Estimated cost \$500.

SISKIYOU COUNTY—Application 6427. Frank L. Cunningham, Happy Camp, for 10 c.f.s. from Oak Flat Creek tributary to Klamath River to be diverted in Sec. 32, T. 16 N., R. 7 E., H. M., for power purposes. Estimated cost \$1,000.

SOLANO COUNTY—Application 6444. A. C. and Minnie T. Sullivan, Winters, for 0.37 c.f.s. from Miller or Pleasant Valley Creek tributary to Putah Creek to be diverted in Secs. 1 and 2, T. 7 N., R. 2 W., M. D. M., for irrigation purposes.

TRINITY COUNTY—Application 6429. C. M. Salver, Trinity County, for 125 c.f.s. from Campbell Creek (sometimes known as Madden and Vergin Creek) tributary to South Fork of the Trinity River to be diverted in Sec. 20, T. 6 N., R. 5 E., H. B. M., for hydraulic mining purposes.

Permits to Appropriate Water Issued by the Department of Public Works, Division of Water Resources, During September, 1929.

EL DORADO COUNTY—Permit 3335, Application 6006. Issued to L. G. Johnson, Arbuckle, Sept. 23, 1929, for 200 gals. per day from Channel Spring in Sec. 15, T. 11 N., R. 17 E., M. D. M., for domestic purposes. Estimated cost \$75.

EL DORADO COUNTY—Permit 3328, Application 6238. Issued to Pacific Gas & Electric Co., San Francisco, Sept. 16, 1929, for 0.025 c.f.s. from unnamed spring in Sec. 30, T. 11 N., R. 14 E., M. D. M., for domestic and industrial use. Estimated cost \$1,000.

HUMBOLDT COUNTY—Permit 3329, Application 6391. Issued to Thos. H. Salvage, Eureka, Sept. 23, 1929, for 0.01 c.f.s. from unnamed spring in Sec. 30, T. 2 S., R. 1 W., H. M., for irrigation and domestic purposes. Estimated cost \$300.

INYO COUNTY—Permit 3330, Application 3391. Issued to Alfred Giraud, Bishop, Sept. 26, 1929, for 0.003 c.f.s. from Eaton Springs in Sec. 12, T. 23 S., R. 41 E., M. D. M., for watering stock. Estimated cost \$750.

MADERA COUNTY—Permit 3336, Application 5769. Issued to J. H. Woodson and J. R. Bowler, Fresno, Sept. 28, 1929, for 2 c.f.s. direct diversion and 200 a.f. storage from Jackass Creek and Jackass Lake, in Secs. 4 and 10, T. 5 S., R. 24 E., M. D. M., for power. 40 h.p. to be developed. Estimated cost \$500.

MENDOCINO COUNTY—Permit 3327, Application 6054. Issued to W. A. Foster, Willits, Sept. 13, 1929, for 0.1 c.f.s. from Rattlesnake Creek in Sec. 20, T. 23 N., R. 16 W., M. D. M., for irrigation and domestic use. Estimated cost \$400.

MONO COUNTY—Permit 3337, Application 6054. Issued to Nyle Smith, Los Angeles, Sept. 30, 1929, for 200 gals. per day from unnamed spring in Sec. 16, T. 4 S., R. 27 E., M. D. M., for domestic use. Estimated cost \$35.

MONO COUNTY—Permit 3326, Application 6321. Issued to M. Zuckerman, Inc., Stockton, Sept. 12, 1929,

for 200 gals. per day from Rock Creek in Sec. 33, T. 4 S., R. 30 E., M. D. M., for domestic purposes. Estimated cost \$400.

MONO COUNTY—Permit 3325, Application 6320. Issued to John S. Zuckerman, Berkeley, Sept. 12, 1929, for 200 gals. per day from Rock Creek in Sec. 33, T. 4 S., R. 30 E., M. D. M., for domestic purposes. Estimated cost \$50.

PLUMAS COUNTY—Permit 3322, Application 6314. Issued to W. M. Cayton, Virginia, Sept. 11, 1929, for 0.044 c.f.s. from unnamed spring in Sec. 20, T. 25 N., R. 8 E., M. D. M., for domestic and irrigation use on 1½ acres.

SAN BERNARDINO COUNTY—Permit 3332, Application 6300. Issued to Homer Aldrich Rue, Los Angeles, Sept. 27, 1929, for 0.31 c.f.s. from Horsethief Canyon in Sec. 31, T. 3 N., R. 4 W., S. B. M., for irrigation of 25 acres and domestic use. Estimated cost \$2,500.

SAN BERNARDINO COUNTY—Permit 3331, Application 6165. Issued to Homer Aldrich Rue, M.D., Los Angeles, Sept. 27, 1929, for 0.50 c.f.s. from Horsethief Canyon in Sec. 31, T. 3 N., R. 4 W., S. B. M., for domestic use and irrigation of 40 acres. Estimated cost \$2,000.

SAN BERNARDINO COUNTY—Permit 3333, Application 6221. Issued to Frank Marek, Summit, Sept. 27, 1929, for 0.06 c.f.s. from Horsethief Canyon and Mojave River in Sec. 36, T. 3 N., R. 5 W., S. B. M., for domestic use and irrigation of 3 acres.

SAN JOAQUIN COUNTY—Permit 3324, Application 6180. Issued to Mollie Raspo, Banta, Sept. 12, 1929, for 9.75 c.f.s. from Lone Tree Creek in Sec. 6, T. 4 S., R. 6 E., M. D. M., for irrigation of 780 acres. Estimated cost \$1,000.

SAN JOAQUIN COUNTY—Permit 3320, Application 6316. Issued to C. B. and W. S. Orvis, Stockton, Sept. 6, 1929, for 10.12 c.f.s. from Upland Canal in Sec. 33, T. 4 N., R. 5 E., M. D. M., for irrigation use. Estimated cost \$6,500.

SAN JOAQUIN COUNTY—Permit 3319, Application 6315. Issued to The Inland Finance Corporation, Stockton, Sept. 6, 1929, for 3.1 c.f.s. from Upland Canal in Sec. 33, T. 4 N., R. 5 E., M. D. M., for irrigation of 248.2 acres. Estimated cost \$6,500.

SISKIYOU COUNTY—Permit 3321, Application 6095. Issued to G. D. and J. G. Williamson et al., Chico, Sept. 10, 1929, for 15 c.f.s. from 3 unnamed creeks in Sec. 29, T. 14 N., R. 6 E., H. B. M., for mining purposes. Estimated cost \$2,500.

TUOLUMNE COUNTY—Permit 3323, Application 6352. Issued to Isabel Laughlin Raube, Modesto, Sept. 11, 1929, for 0.0025 c.f.s. from spring in Sec. 12, T. 1 N., R. 15 E., M. D. M., for domestic purposes. Estimated cost \$110.

VENTURA COUNTY—Permit 3334, Application 6261. Issued to Sam J. Akers, Fillmore, Sept. 27, 1929, for 0.26 c.f.s. from Sespe River in Sec. 12, T. 4 N., R. 20 W., S. B. M., for 2112 acres, irrigation and domestic. Estimated cost \$1,000.

AWARD OF CONTRACTS DIVISION OF ARCHITECTURE

SAN DIEGO STATE TEACHERS COLLEGE—Pet-tifer Hunt Company—For general work on the Academic Building. Contract price, \$137,350.

W. H. Robinson—For heating, ventilating and plumbing work on the Academic Building. Contract price, \$25,722.

Capitol Electric Company—For electrical work on the Academic Building. Contract price, \$13,720.

MENDOCINO STATE HOSPITAL (Talmage)—J. S. Hannah—For general work on wards "15" and "K." Contract price, \$99,900.

Collins Electrical Company—For electrical work on above buildings. Contract price, \$2,983.

Nottingham Heating and Ventilating Company—For plumbing and heating on the above buildings. Contract price, \$19,666.

SAN FRANCISCO STATE TEACHERS COLLEGE—F. C. Amoroso & Sons—For constructing sidewalk and retaining wall. Contract price, \$15,897.

CALIFORNIA POLYTECHNIC SCHOOL—R. S. K. MacMillan—For general work on Boys' Dormitory. Contract price, \$27,900.

Walter H. Smith—For mechanical work on above. Contract price, \$8,675.

STATE OF CALIFORNIA

Department of Public Works

HEADQUARTERS: PUBLIC WORKS BUILDING, ELEVENTH AND P STS., SACRAMENTO

C. C. YOUNG-----Governor

B. B. MEEK-----Director

CORNING DE SAULES-----Deputy Director

DIVISION OF HIGHWAYS

CALIFORNIA HIGHWAY COMMISSION

RALPH W. BULL, Chairman, Eureka
J. P. BAUMGARTNER, Commissioner, Santa Ana
M. B. HARRIS, Commissioner, Patterson Bldg., Fresno
JOSEPH M. SCHENCK, Commissioner, c/o United Artists Studio, Santa Monica Blvd., Los Angeles
FRED S. MOODY, Commissioner, 640 Kohl Bldg., San Francisco
C. H. PURCELL, State Highway Engineer, Sacramento
GEORGE C. MANSFIELD, Secretary
HARRY A. ENCELL, Attorney, San Francisco

HEADQUARTERS STAFF, SACRAMENTO

G. T. MCCOY, Administrative Assistant
L. V. CAMPBELL, Office Engineer
T. E. STANTON, Materials and Research Engineer
FRED J. GRUMM, Engineer of Surveys and Plans
C. S. POPE, Construction Engineer
T. H. DENNIS, Maintenance Engineer
CHAS. E. ANDREW, Bridge Engineer
R. H. STALNAKER, Equipment Engineer
E. R. HIGGINS, Chief Accountant

DISTRICT ENGINEERS

F. W. HASELWOOD, District I, Eureka
H. S. COMLY, District II, Redding
CHARLES H. WHITMORE, District III, Sacramento
J. H. SKEGGS, District IV, San Francisco
L. H. GIBSON, District V, San Luis Obispo
E. E. WALLACE, District VI, Fresno
S. V. CORTELYOU, District VII, Los Angeles
E. Q. SULLIVAN, District VIII, San Bernardino
F. G. SOMNER, District IX, Bishop
R. E. PIERCE, District X, Sacramento
General Headquarters, Public Works Building,
Eleventh and P Streets, Sacramento, California

DIVISION OF WATER RESOURCES

EDWARD HYATT, State Engineer, Chief of Division
J. J. HALEY, Jr., Administrative Assistant
HAROLD CONKLING, Deputy in Charge Water Rights
A. D. EDMONSTON, Deputy in Charge Water Resources Investigation
R. L. JONES, Deputy in Charge Flood Control and Reclamation
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SPENCER BURROUGHS, Attorney
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Port of Eureka—F. B. Barnum, Supervisor
Port of San Jose—Not appointed
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STATE HIGHWAYS IN CALIFORNIA SHOWING THE PRIMARY AND SECONDARY ROAD SYSTEMS AND THE DIVISION OF THE STATE UNDER THE BREED BILL.



California Highways and Public Works

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Measuring the Water Crop In California's Snow Fields

By HARLOWE M. STAFFORD, Hydraulic Engineer, Division of Water Resources, State Department of Public Works

THROUGH appropriation by the 1929 legislature of \$30,000 for the biennium 1929-1931, the State of California, acting through its Department of Public Works, Division of Water Resources, has definitely entered the field of snow surveying.

The purpose of a state-wide snow survey and the objects to be

attained are more or less self-evident. The power companies and a few of the irrigation districts have recognized the value of knowing from snow surveys in the early spring what to expect as run-off from the snow in the period April to July or August. These agencies have, therefore, been doing snow survey work in California for some



HARLOWE M. STAFFORD.

time, varying from thirteen years for the South Yuba surveys of the Pacific Gas and Electric Company to one or two years work recently inaugurated by irrigation districts on the Middle Yuba, Merced, and South Kings rivers.

FUTURE VALUE

Looking into the not distant future, under the consummation of plans for a statewide coordinated use of water, now the subject of intensive administrative and legislative investigation and planning, a single great reservoir or group of reservoirs on one stream may be required to coordinate as many as seven apparently conflicting uses of water such as, irrigation, power, flood control, municipal, navigation, salinity control and hydraulic mining. In the intricate regulation that will be here required, the value and the necessity of run-off forecasts as derived from snow surveys and meteorological observations can hardly be questioned. It will be seen that the benefits to be derived from an adequate system of statewide snow surveys, and run-off predictions are not confined to the immediate

practical or local uses by power companies, irrigation districts, municipal districts, etc., in the administration of their projects. The broader necessity is for such information to guide the use of water from year to year over large areas such as the entire length of the Sacramento, the San Joaquin, and the Kings rivers.

The purpose of the California snow survey is not to supplant the work that is now being done by individual agencies but rather to cooperate with these agencies, to correlate, standardize and expand the present work and, as funds permit, to so extend the surveys that annual forecasts of run-off for all of the major stream basins of the Sierra may be possible.

Investigation was made of the methods used and results obtained in snow surveying by the



A snow surveyor at work.

agencies in California that have been doing this work and by other states. It was found that in most every case the surveys, when carefully conducted, had proven of practical value and that reliable forecasts of run-off were possible.

METHOD TO BE USED

As to the methods of snow surveying, the most successful and one most widely used is that pioneered and developed by Dr. J. E. Church, of the University of Nevada. This method, known as the percentage method, is that which California proposes to use in its work. Briefly, the procedure under the percentage method comprehends the determination of the water content of the snow cover at properly selected "snow courses" in each basin or region by means of suitable sampling apparatus and from the data obtained, the determination of the percentage relationship of the seasonal snow cover of that basin to its normal: under the assumption that such percentage is indicative of a corresponding percentage which the coming seasonal run-off in the stream below bears to its normal.

The percentage method relies upon the fact that the large storms which furnish the bulk of the winter snow are comparatively uniform in intensity over considerable areas and it is therefore possible to select a few snow survey



Sandbag shelter hut and snow survey headquarters on Mt. Rose.

courses distributed over characteristic parts of a stream basin, the averaged data from which will furnish a close index of the seasonal percentages of snow cover for the entire basin.

SELECTION OF COURSES

The selection of snow courses to properly represent each basin requires considerable care and after a year or two it may be necessary to change or substitute some of the first selections to finally obtain suitable and repre-

(Continued on page 19.)



Sampling the snow at Mt. Rose. The snow is as deep as the sampler is long.

How California is Solving the Problem of Separating Highways and Railroads

By HARRY McCLELLAND, Right of Way Agent, Division of Highways.

THE BOOKS abound with the ancient maxim "To state the problem is to solve it." This not so simple when we seek the solution of the tremendous task of eliminating the tragic dangers of grade crossings on the state highway system of California. At any rate here is the problem:

It is necessary for a motorist who seeks to travel the 7000-mile net work of state highways to traverse 559 railroad crossings. Of this number 96 have been separated, 35 by overhead crossings and 61 by subways, and over these our traveler may drive with ease and safety but woe to him if he does not "Stop, Look and Listen" on the other 463. To analyze a little further: Of these crossings at grade 87 are over spur and side tracks and 134 are within the corporate limits of cities.

We are of the opinion that eventually at least 25 per cent of these spur track crossings, especially those which intersect important arteries of traffic, must of necessity be eliminated. Nor do we minimize the importance of crossings within cities, but we will narrow our problem. *We have left, therefore, in California outside of municipalities state highways crossing 242 main line railroad tracks at grade.* This is the problem.

What of the solution?

The Department of Public Works, Division of Highways, is now embarked on the most comprehensive and ambitious program for the elimination of grade crossings ever undertaken in California. During the biennium commencing July 1, 1929, and ending June 30, 1931, there will have been constructed 24

overhead or subway structures on the more important roads and at the most dangerous railroad crossings. *On an average of once a month during the next two years there will be incorporated into the great highway system of California a grade separation.*

This program is all the more remarkable when we consider that after nearly 20 years of state highway organization there are now only 96 grade separations and that many of these were constructed prior to that time and inherited by the state from counties and cities.

Nor is that all. Plans are being completed which contemplate the elimination of at least 10 dangerous grade crossings by changing the routing and alignment of highways. The result will be, therefore, that in 1931, there will have been added 34 grade crossing eliminations.

To accomplish this entails an expenditure of upward of \$3,000,000, but it is difficult to measure in dollars and cents the protection of life and the insurance of safety which is commensurate with the

high standards which are being built into the highways of California.

Before the state launched upon this great undertaking there was prepared a complete and comprehensive schedule to be followed. All railroad companies whose interests were in any way involved were apprised of the plans and desires of the Department and the almost universal cooperation which was accorded is indicative of the vision and fairness of those men who control the destinies of the railroads of California.

By virtue of the Public Utilities Act, the

RAILROAD GRADE CROSSING SITUATION IN PERSPECTIVE

There are at the present time on the state highway system outside of municipalities 242 main line railroad tracks at grade.

On an average of once a month during the next two years there will be incorporated into the state highway system of California, a grade separation structure.

Plans are being completed which contemplate the elimination of at least ten dangerous grade crossings by changing the routing and alignment of highways.

Including main line grade crossings both within and without municipalities and grade crossings over spur tracks, there are at present 559 railroad crossings. Of these crossings at grade 87 are over spur and side tracks and 134 are within the corporate limits of cities. Eventually at least 25 per cent of these spur track crossings must be eliminated.

To date there have been 96 grade separation structures built, of which 35 are overhead crossings and 61 subways. In 1931 there will have been added 34 grade crossing eliminations.

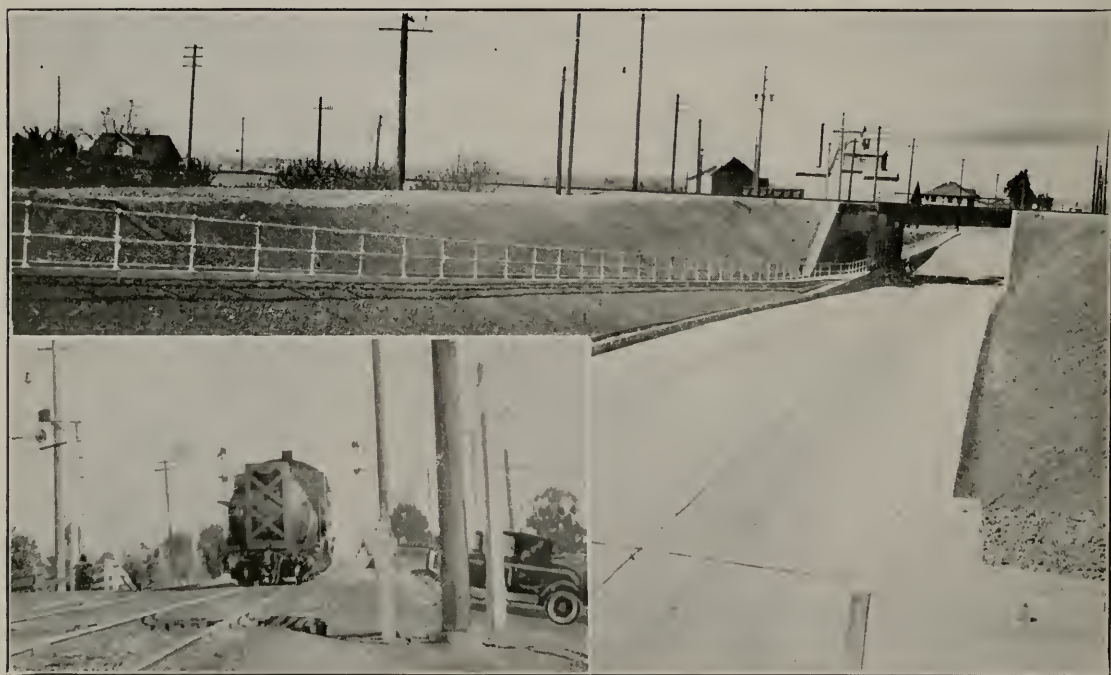
California Railroad Commission has jurisdiction to determine the necessity for a public crossing over a railroad, the manner of the crossing, the adequacy of design, and to apportion the cost of the construction between the railroad and the political subdivision affected. No grade separate structure may be erected without an order from the Commission and all plans for the same must be approved by that body.

There may be gleaned from a long line of decisions which the Commission has handed down, certain fundamental principles, which have become precedents to be followed. Of course every case presents a new problem and must be considered in its own particular merits, but certainly the following principles, governing the division of costs between the

3. Where a separation is constructed which does not close an existing grade crossing the Commission has generally divided the cost, 25 per cent to the railroad, and 75 per cent to the state.

These guideposts, governing the troublesome question of the conflicting equities in the allocation of costs are based upon the theory, which will be found running through countless decisions of the Railroad Commission and has become firmly fixed, that irrespective of priority of location the railroads have a continuing obligation to afford a safe and convenient means of crossing their right of way and tracks. This thought is clearly stated and the principle announced, in Decision 14403 wherein the Railroad Commission says:

"The question of the apportionment of the cost of



Before and after. The Brighton grade crossing as it was before a grade separation structure was built, and the present Brighton subway.

railroad and the state, are now definitely established.

1. Where a separation completely eliminates an existing grade crossing, the cost of the structure together with grade and alignment in conformity with highway standards is divided equally between the state and railroad. The state is charged with the cost of extra width of pavement in excess of the existing width and the railroad with the cost of providing for extra tracks.

2. The cost of the improvement or replacing at a different location of an inadequate existing separation is divided equally between the railroad and the state, excluding the paving of the highway outside the track supporting structure.

a grade separation as between the public and the railroads is one that generally is not completely susceptible of mathematical determination upon any basis of relative benefits, relative hazards or relative necessity. It is true, however, that railroads are always constructed with the hope and expectation that the communities which they are to serve will grow in population and prosperity. Such growth brings with it new and divers hazards and, at the same time, creates new obligations. On the other hand, it appears fair and just that the public, the growth of which in a large measure creates the new dangers and necessities, should bear a part of the cost of those facilities which will relieve these new conditions, and, on the other hand, it seems equally fair and just that the railroads which benefit directly



The twin subways at Serra in Orange County.

and in a vital manner from the very growth in population and traffic which creates the new hazards should share in the cost of minimizing them. The railroad, by its construction, incurs an obligation to reduce to a minimum the hazard and inconvenience to other traffic, that such a barrier interposes to free communication between the two portions of a community that it so divides. This obligation continues and increases with the development of the community



Undergrade crossing on state highway near Whittier in Los Angeles County consisting of two 30-foot roadways.

which it serves. The absence of any logical or mathematical measuring stick by which to test, the usual crossing separation cost apportionment problem, early led both this Commission and most parties appearing before it to the conclusion that a fair method would be the assessment of equal portions of the cost upon the two major interests, and the justice of this conclusion has seldom been questioned."



The Irvine overhead on the Coast Highway in Orange County.

Reports Progress In Registration Of Contractors

JAMES F. COLLINS, director of the Department of Professional and Vocational Standards, reported in part as follows to the October 30th meeting of the Governor's Council:

The work of the department during the past month has continued to be centered around the registration of contractors as the major activity. While the number of applications for licenses under the contractors' registration law has not been as many as should be the case, an increase in the daily number of applications received has been noted during the past two weeks. A plan of direct mail contact with all known contractors in California has been inaugurated, and after the sending of the second and final notice it will be necessary to take drastic action under the provisions of the law. Due to lack of information regarding the law, which has been found to be general throughout the construction industry, it is the policy of the department to reach all responsible contractors with adequate information before the penalties of the law are invoked.

CONTRACTORS REGISTRATION

Number of applications received.....	7,175
Number of applications returned.....	603
Number of applications approved.....	6,572
Number of licenses issued.....	6,572
Number of employees.....	15

In another decision the Commission said:

"In the vicinity of Sacramento, practically all railroads are on high fills or trestles which act as barriers to the safe and convenient flow of traffic and to free growth of the surrounding country areas. Even under ordinary conditions, the long, narrow right of way of a railroad with its high speed trains acts, to a certain extent, as such a barrier. The railroads have thus incurred an obligation to participate in the cost of providing reasonably safe and convenient means of allowing the public to travel across their lines."

That these propositions are readily accepted by the railroad is shown by the fact that rarely in recent years has it been necessary to appeal to the Railroad Commission to adjudicate differences between the railroads and the state, respecting the allocation of costs of grade separation structures.

When we first contemplate the elimination of grade crossings, the task looms gigantic, as indeed it is, but it is submitted that a continuation of the comprehensive program, which has been inaugurated will result in removing a great bulk of those hazards from the state highways of California, within the next decade.

Careless Faults of Careful Drivers

By EUGENE W. BISCAILUZ, Superintendent of the California Highway Patrol

MY FRIEND John — is a traveling salesman and wears out one car every year. He is a careful driver. John was in my office recently.

"I've never been in an accident although I've driven cars since they began making 'em," said John. "I never drive over about 40 and I seldom ever take any chances."

Two days later John was driving over a rolling country in the hills not far from Bakersfield, trying to get home that night. Just at the bottom of a short hill he overtook a truck loaded with farm produce. The truck was going exasperatingly slow. John fell in behind, shifted into second. Near the top, the truck almost stopped. John was now in low and angry. He stepped hard on the gas, threw the car into second again, swerved sharply to the left and zoomed by the truck just in time to meet a touring car head-on that was coming over the hill.

THE PRICE OF FOLLY

Fortunately, neither car was going very fast. John came out with a few scratches and the other driver had a broken leg. John's insurance company paid the hospital bills and had both cars repaired.

"I knew when I was doing it that I shouldn't," John confided to me afterward. "But dang it all, I got a little sore. I took the first chance in my life and got hooked."

But John is a careful driver!

Not long ago I was talking to George —, a theatrical agent. He buys big cars and drives them hard. He is an expert at the wheel and has an eye that measures distance and the approach of other cars to the

inch. He told me he had never had an accident of any kind.

"How fast do you drive?" I asked.

"O, not so fast," he said. "Thirty-five or forty on the curves. Fifty and sometimes sixty on the straight-a-way if none of your men are around."

"That's pretty fast, old boy," I warned. "You may get away with it but you're taking a chance."

DISREGARDS JUDGMENT

One hot afternoon about a week later, George headed south from Fresno. Stopping for gas at a service station near the edge of the town he noted one of his tires had worn clear through the tread into the inner fabric.

"Hang it, I ought to have that tire taken off and my spare put on," he said to himself. "But I guess it'll be all right. I'm in an awful hurry."

On a level road with not a car in sight George forgot all about the weak tire and stepped his machine up to sixty.

He struck a small chuck hole and the tire went out with a

bang. Before he could control it, the car headed into a telephone pole and turned over twice. George crawled out not badly hurt but he will carry a scar the rest of his life over the right eye from flying glass. The car was a wreck.

ALL HAVE FAULTS

I could go on giving examples of this kind from now until doomsday. The point of it is that every man, no matter how careful he thinks he is as a driver has some faults that ought to be corrected or will make a slip that

TEN CARELESS FAULTS OF CAREFUL DRIVERS; ARE YOU GUILTY?

In this article Eugene M. Biscailuz, Superintendent of the California Highway Patrol, tells of accident-causing practices of motorists, who consider themselves as careful drivers. Here is the list:

Attempt to pass cars (not always, but occasionally) without knowing that you are in the clear;

Take a chance on weak tires;

"Go nowhere in a hurry"; in other words speed without anything to be gained by speed;

Give signals in a sloppy manner;

Cut corners at corners where you think traffic is light;

Follow other cars too closely;

Endanger coming traffic by glaring lights on your car, at the same time "cussing" other drivers for their lights;

Allow your rear light to be dimmed by dust or dirt;

Drive down steep grades in high gear;

Do your driving according to your mood: today carefully, tomorrow recklessly?

will spell disaster unless he is continuously on the alert.

John lost his temper; George was careless. And there you are.

Somebody does make slips, every day in the year. If you want proof look at our statistical records. More than 1000 killed in auto crashes during the first six months of the year and the total climbing steadily toward the 2000 mark! More than 25,000 persons injured in the state in motor mishaps in eight months!

ARE AVOIDABLE

It is not idle talk when we say 95 per cent of the accidents are avoidable. Out of the thousands of cases we have examined very few have been found where the circumstances were such as to make the accident unavoidable.

The automobile as it is built today is practically foolproof. The accidents due to faulty construction or to breakdowns in vital points, such as the steering gear, are almost negligible. Always, it is the driver; not the car.

It has been most interesting for us to find out that, as in John's case, most of the drivers involved in accidents, when pinned right down, will admit they were doing something they shouldn't have been doing and that *they knew it beforehand*.

PLENTY OF EXCUSES

"Yes, I had a feeling, I was going a little too fast." * * * "Well, I was about even with the train and I was a little afraid I couldn't make it but I took a chance." * * * "The hill did look a little steep but I thought I could make it all right in high and I would have been all right if I hadn't hit that gravel just as I put the brakes on." * * * "Sure, I knew I'd have to cut in but I didn't know the other car was coming quite so fast."

These are only a few of the excuses.

The truth of it is that thousands of persons who pride themselves on being careful drivers are guilty every now and then of "taking a chance." And no person is entitled to be called a careful driver unless he drives carefully 100 per cent of his time.

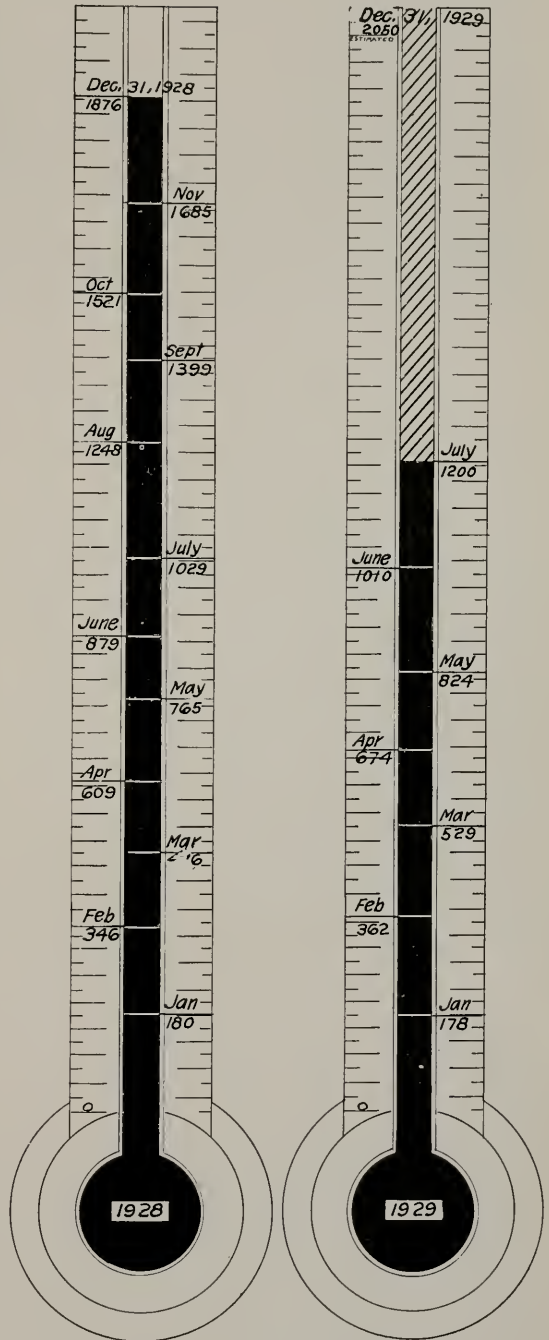
What would it have availed John had he passed the truck without accident? He possibly would have saved from 10 to 25 seconds.

SPEED GAINS NOTHING

How much time does the man who drives at fifty save over the man who drives at the legal rate of forty? In the course of eight hours of driving he will only be about eighty miles ahead.

(Continued on page 23.)

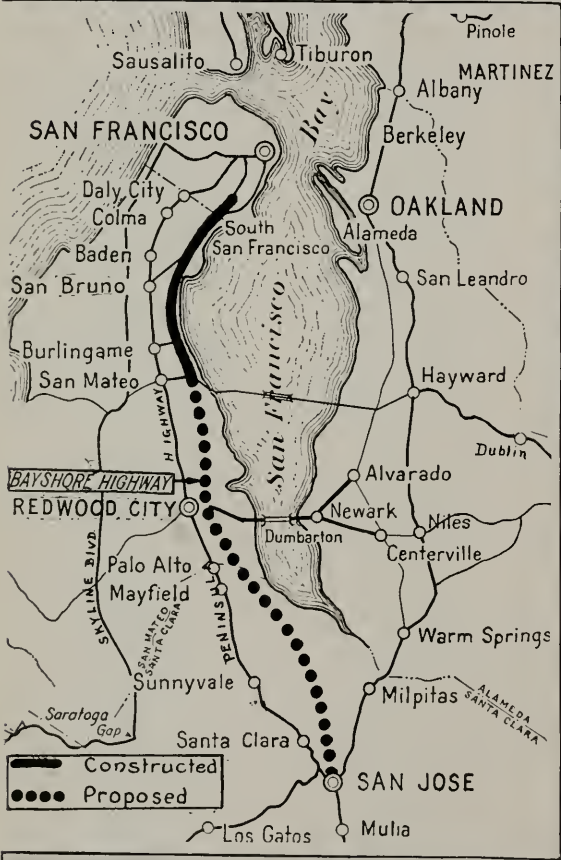
THE DEATH RECORD



The two thermometers pictured above show the danger of careless driving to the lives of the people of California. Highway fatalities in 1928 totaled 1876 persons. If the present highway fatality rate in California continues, 2050 persons will be killed this year in automotive accidents in this state.



*Scenes at the
Dedication
of the
Bay Shore Highway*



The Bayshore Highway Dedication

By COL. JOHN H. SKEGGS, District Engineer.

UNDER the auspices of the leaders of the state and the city of San Francisco, the last great natural barrier to free communication between the northern and southern parts of the peninsula, was formally declared abolished with the dedication of the Bayshore Highway, on October 20, 1929.



JOHN H. SKEGGS.

At impressive ceremonies directed by Supervisor Frank R. Havenner of San Francisco, the Governor of the state, C. C. Young, followed by Congressman Richard J. Welch, City Engineer M. M. O'Shaughnessy, State Director of Public Works, B. B. Meek, Sylvester J. McAttee, representative of civic bodies active in the promotion of the highway, and Mayor James Rolph,

commended the work accomplished and urged the early completion of a southerly extension to San Jose.

EARLY HISTORY

Since early days, San Francisco, because of the topography, has had to content herself with two woefully inadequate vehicular outlets to the south; on all other sides, deep water both hampered and promoted her development. Of these two roads, the central one, known as El Camino Real or the Peninsula Highway, now Route 2 of the state highway, had the greater share of the traffic on account of its geographic position with respect to the traffic arteries of the older towns, and its better grades and alignment.

The other road, northerly of its junction with El Camino Real, at a point about 11 miles south of the center of the city, followed

the bay shore, alternately dipping far inland to avoid marshy ground, and then equally as far bayward to swing around rocky headlands. The construction of the Southern Pacific Railroad bay shore cutoff in 1906 changed the location of the then existing road considerably, but still on narrow right of way and road-bed, on inferior alignment and grades, but worst of all, dumped the traffic into San Francisco on ill paved, narrow streets, hard to find, twisting and bending their way nowhere in particular. Small wonder that in those days it afforded little relief for the swelling traffic on El Camino Real, where congestion had long reached an intolerable stage the entire length of the road from San Francisco to San Jose.

The answer to the imperious demands of the traffic was soon discovered by civic leaders and engineers of the city and state, and consisted of two parts, first: the widening and improvement of El Camino Real, which was undertaken forthwith; second: a new, broad highway from near the center of the city to San Jose, located as far east as practicable, of the central highways and the towns strung like beads along it.

The agitation for the construction of the new highway came to a head in the 1923 legislature, when a statute was passed creating the Bayshore Highway and a later act in 1925 established this route as an integral part of the state highway system, extending from Army and Potrero streets in the heart of San Francisco to the city of San Jose.

CONSTRUCTION COMMENCES

It is one thing to establish a highway on paper by legal enactment; it is quite another to establish it on the ground without funds, and the project might have languished for some time, if the city of San Francisco had not stepped into the breach with a contribution of \$500,000, thus enabling the construction of 5.2 miles, the first unit from South San Francisco to Burlingame in 1924 and 1925.

This section of the highway is located across marsh and tidelands and involved many engineering difficulties. It was for rough grading only and completion of the contract was of small use to the traffic on account of the difficulty of finding the two ends and crossing the main tracks of the Southern Pacific at grade.

Views on the opposite page show the spectacle in San Francisco when the Bayshore Highway was dedicated on October 20, 1929. The upper view shows the crowd in attendance. Below is a view of the parade and a picture of a section of the highway. The other three pictures show Governor C. C. Young, M. M. O'Shaughnessy, City Engineer of San Francisco, and B. B. Meek, Director of the Department of Public Works (lower left hand picture) addressing the crowd who attended the dedication ceremonies.

This work was immediately followed by the construction of the great South San Francisco underpass at a cost of approximately \$275,000 and the surfacing of the section above described in 1928. At the same time a southerly extension 3 miles in length from Burlingame to San Mateo was constructed and with the improvement of laterals the road, for the first time, was of real relief to the former main highway down the peninsula. Before this road could come into its own, however, there remained the 3.1 miles section within San Francisco city limits and the 3½ miles section from the city limits to South San Francisco to be financed and improved.

FILLING THE GAP

This work, in both instances, involved construction of the heaviest character and on a scale never before undertaken by either the city or the state. The city's share of the work, 3.1 miles in length, cost over \$2,000,000 a large share of the cost being for new right of way and the moving, reconstructing or buying outright of over one hundred buildings. The right of way on this section is not less than 125 feet wide, with additional width to take care of slopes where necessary. Small attention was paid to existing streets and much of the right of way is through new territory. A paved roadway 100 feet wide has been constructed throughout, and for the greater part of the distance sidewalks have been installed 12½ feet wide on each side of the roadway. The standard type of pavement is 8 inches of plain concrete with a surfacing of 3 inches of asphaltic concrete. Fill sections where settlement may be expected have been given a temporary surface. The standard pavement is noteworthy for its enormous carrying capacity and the care that was taken in its construction to produce the highest strength of Portland cement concrete and the highest stability for the asphaltic concrete.

A pleasing feature of this section is the almost total absence of pole lines and unsightly street constructions of all kinds. Three pedestrian subways are constructed under the road to take care of the most dangerous pedestrian crossings.

At approximately the same time that the city commenced work on its section, the state awarded a contract for the 3½ miles south of the city, and throughout the construction period there was a friendly rivalry between the engineers and the contractors on the two sections to be the first at the finish. The actual finish was practically a dead heat. Both sections were in fine shape for the formal opening.

This state highway was designed on standards higher than heretofore attempted, providing a minimum right of way width of 125 feet throughout; a maximum grade of 4 per cent and curvatures not exceeding 1500 feet except at one point over the Southern Pacific's Sierra Point tunnel, where a radius of 750 feet was used. Because of the enormous cut involved, even on this radius, over 400,000 cubic yards of material were moved and due to landslides the end is not yet in sight.

The first three-fourths of a mile south of San Francisco was graded full width, gradually narrowing into a minimum of a 60-foot roadway in cuts. The typical section of roadway on fills also provided for a 60-foot roadway. However, due to the great volume of slides many of the fills are also full width.

A 2-foot bituminous macadam surface on an 8-inch waterbound macadam base 40 feet in width was placed the length of the project. This will later be replaced with permanent surfacing when the fills have reached their full settlement and when funds are available.

CONSTRUCTION FEATURES

Extraordinary difficulties were encountered during construction, hemmed in as this road is by the Southern Pacific Railroad on one side and the 44-inch Spring Valley Water main supplying San Francisco's downtown and industrial district on the other. This pipe line has been moved at many places to clear the new right of way. This operation was difficult and expensive totaling in cost approximately \$150,000.

A massive rubble retaining wall over 300 feet in length, 24 feet in height above grade and an equal amount below grade had to be constructed across the face of an old slide area to hold the pipe line above the highway and prevent the slide from overrunning the road. The construction of this wall was a race between rainy weather and all the equipment and men that the contractor could throw into the limited working space.

Under the pressure of the great sliding mass 12-inch by 12-inch cross-bracing crumbled like matches and still there was no foundation in sight. Anxiety for the safety of the large force of men engaged in hand work 25 feet below the surface was constant and a great sigh of relief went up when it was finally determined that suitable foundation had been reached.

In the meantime slide movements had taken place under the trestle supporting the Spring Valley pipe above and some distance back of the wall and it was deemed expedient by the water company and the district office that

(Continued on page 26.)

Heavy Work on Southern Roads

1 1 1 1 1 1

ALL SUMMER traffic has been enjoying the use of the new highway to the San Bernardino mountains. This road has long been known as the Rim of the World Highway or the Crest Drive. Early in the spring a grading contract six miles long was completed and thrown open to the public, making the climb into the mountains possible on high gear. During the spring and summer months the road has been oiled and has now a fine hard surface.

Throngs of motorists from the Los Angeles metropolitan district use this road every week end. Since the completion of the new link this traffic has greatly increased. The oiling of the road and elimination of dust has made the trip into the mountains a pleasure. The old road had grades as steep as 22 per cent and was dusty and disagreeable.

EASTERN travelers entering southern California via the Old Trails Highway and southern California travelers to the Grand Canyon and Zion Park regions, all go through the Cajon Pass.

The upper part of the old Cajon Pass road has long been a source of anxiety and danger to travelers. The combination of narrow road, many sharp turns and the great chasm below has resulted in many serious accidents in past years.

An entirely new road is now well toward completion, eliminating the worst part of the



The loop around "Panorama Point." This point will be beautified with forest trees.

present road. The map shows the new road, compared with the present road.

In order to construct a new road on modern standards in this rough country, it is necessary to make great cuts and fills. This has resulted in the very heavy construction seen in the photographs.

The San Bernardino *Sun* describes the project as follows:

VICTORVILLE, Oct. 3.—Mountains are being moved along the westerly side of Cajon Pass in the reconstruction work being done on the National Old Trails. The work is of such a stupendous nature that the topography of the pass will show a material transformation. Few people conceived the magnitude of



A cut and fill on Cajon Pass.

the project until they saw the mountain crest moved away and deep, wide cuts made huge fills in the canyons below the new road.

The contractors have progressed with the construction work until it is possible to get an adequate conception of the new highway curves for more than three miles through the pass. The new road will be safe as compared with the present route with its many



View of the completed oiled surface on the edge of Big Bear Lake.

acute curves. The scenic outlook will be as entertaining as from the present road, and the occupants of an automobile may enjoy it without fear of meeting some wild driver trying to take all of the roadway on a sharp turn.

SCENIC CHARM TO BE RETAINED

Those who have traveled day after day through the Cajon Pass may have become so accustomed to it as to fail in appreciation of its charm, but those who traverse the region for the first time are delighted with its peculiar beauty and ever changing phases of interest.

The contractors hope to have the new section of the highway complete and ready for travel in January or February unless the early part of the winter is unusually wet.

Secretary Hyde Offers 3 Definite Suggestions for Billboard Curb

ARTHUR M. HYDE, secretary of the U. S. Department of Agriculture has addressed a letter to Ralph W. Bull, chairman of the California Highway Commission, containing three suggestions for the betterment of billboard conditions along highways. Mr. Hyde's letter is as follows:

DEPARTMENT OF AGRICULTURE

Washington, D. C.

October 22, 1929.

Mr. Ralph W. Bull, Chairman,
California Highway Commission,
Sacramento, California.

Dear Mr. Bull:

In a communication from the Outdoor Advertising Association of America I recently received three concrete suggestions for the improvement of conditions in regard to highway advertising signs. I am transmitting these suggestions, which are:

1. Participation by engineers of the Bureau of Public Roads in the selection of scenic sections where objectionable roadside conditions should be immediately remedied, and in the allied activities of the association's state organization.

2. Reports from the highway engineers to the Committee on Public Relations of the Outdoor Advertising Association of America, 2 Park Avenue, New York City, on specific structures and locations which are traffic hazards, which obscure the view of highway markers, or which are otherwise objectionable. Prompt action will follow.

3. Similar cooperation on the part of all members of the American Association of State Highway Officials in their respective states.

I have of course no intention or desire either to add to the burdens of highway officials or to influence their action further than such merit as these suggestions may have, would naturally imply. You are invited to communicate these suggestions to such members of your force as would be interested, leaving to them such action as they may care to take in connection with conditions which they may feel to be objectionable.

Sincerely,

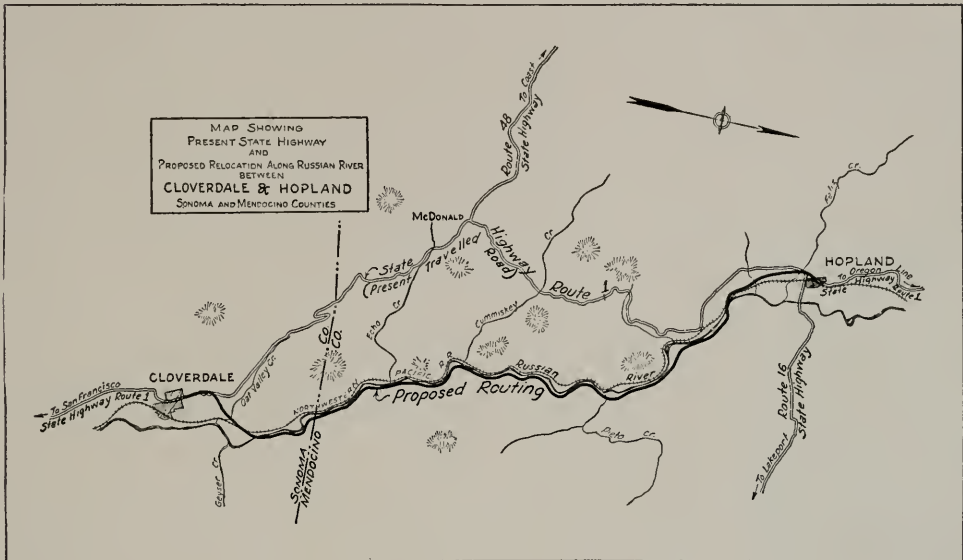
(Signed) Arthur M. Hyde,
Secretary.

There are 56 sharp curves on the present traveled road, many of which can not be traveled safely at more than 15 miles per hour. On the new road there will be 11 easy curves, all of which can safely be traveled at full legal speed limit.

IOWA—Rural speed limit on vehicles weighing less than three tons has been removed.

Redwood Highway Section Relocated

Property of
Seattle Public Library



THE RELOCATION of the section of the Redwood Highway between Cloverdale and Hopland to follow the Russian River in place of the present location over the mountains has been approved by the California Highway Commission following a recommendation to this effect made by the Division of Highways. The decision is subject only to approval by Attorney General Webb as to certain legal questions involved in the transfer of the highway to a new location.

The decision was based upon a careful study of all possible routes for this section of the highway. The river route showed the following decided advantages:

It is approximately three miles shorter than the present mountain route and a mile shorter than the next best alternative route.

Grade and alignment on the river route are excellent, making fast, safe and economic service possible under all conditions.

A large amount will be saved in initial reconstruction costs.

Saving in investment, reduction in distance and elimination of grades produce a capitalized value in favor of the route amounting to \$960,000 immediately and \$1,680,000 in five years when traffic will double.

It will be a scenic river route with camp sites available.

It will readily respond to future widening.

It is the only practicable method of eliminating maximum grades that will aggregate eight miles in length by way of the alternative mountain route. On the latter some sharp curvature is also unavoidable.

The possibility of serious slide conditions on this route were carefully studied by engineers of the Department of Public Works. This same situation was also considered by Dr. George E. Ladd, geologist for the U. S. Bureau of Public Roads. All agreed upon the practicability of constructing the river route.

Authority has been granted to State Highway Engineer C. H. Purcell, to make a standard survey of the river route to definitely determine the details of location and the cost of construction. As no provision for building this section was included in the 1929-1931 budget, actual construction will not be possible during this biennium.

During an extremely cold spell in the Puget Sound country, something gummed the works of a thermometer hung outside the Chamber of Commerce building and the worst it could do was seventy-two above.

Along came a man, bundled up to his ears, but still shivering. For a moment he gazed at the thermometer, then turned away in disgust, saying: "Ain't that just like the Chamber of Commerce, anyway?"

How California Plans its Hospitals

By CARL E. BERG, Engineer of Estimates and Cost, Division of Architecture

A LARGE PART of the work of the Division of Architecture is in connection with the state hospitals of which there are eight at present, namely: Agnew, Mendocino, Napa, Norwalk, Patton, Stockton, Pacific Colony and Sonoma, with a ninth to be started in the southern part of the state in 1930.



CARL E. BERG.

Each one of these hospitals is really a small community or town in itself and some of the larger hospitals have, counting in mates and employees, more than 3500 people within their borders, for whom must be provided all the comforts of modern civilization.

The following short description of a few of the more important buildings and list of other

structures, etc., making up the modern state hospital, with a capacity of approximately 3000 patients will give an idea of the work to be performed by the architect and the engineer in its planning, construction and maintenance, and the investment the state must make in buildings, plants, equipment and land.

THE RECEIVING BUILDING

The first building the patient enters is the so-called Receiving Building. This building, generally a two-story fireproof structure, is a hospital and ward building combined, and in most instances contains special rooms for treatment, such as hydrotherapy, light bath and continuous bath. In this building the patient is kept for observation and treatment for varied periods of time.

For a large institution, this building will have accommodations for approximately 175 patients and its cost will probably be \$225,000, fully equipped.

A TYPICAL WARD BUILDING

From the Receiving Building the patients are distributed to the various wards according to the classification given them. As

already stated, the different wards vary somewhat in their design according to the class of patients they accommodate, and they are either one- or two-story structures, housing from 40 to 120 patients each, either in large dormitories or in individual rooms. A typical ward building will have dining room, with serving kitchen, large living rooms, clothes and shoe rooms, toilet, wash and bath rooms, dormitories and single rooms for the patients, and, as a rule, a few rooms with bathrooms attached for the use of the attendants in charge.

The cost of the different ward buildings will, of course, vary somewhat, but for a large hospital, will average slightly more than \$700 per patient, including the cost of furnishings.

INDUSTRIAL BUILDINGS

To keep the patients occupied, the hospital employs as many as possible in the work necessary for the running and upkeep of both the main institution and the farm, and in addition several shops or industrial buildings are provided, where, under proper supervision, the patients are given healthful occupation, such as rug weaving, toy making, embroidering, reed furniture making, etc.

These industrial buildings are generally two-story fireproof buildings and cost approximately \$35,000 each, with equipment.

HOSPITAL RECREATION

For the patient's recreation, the modern hospital provides one or more assembly halls or auditoriums where movies and plays are given several times a week, and where Divine service is conducted on Sundays. Such an assembly hall was recently completed at the Norwalk State Hospital at a cost of \$75,000, including equipment.

THE HOSPITAL KITCHEN

One of the most important buildings, especially from the patient's and average employees' standpoint, is the kitchen. Great strides have been made in recent years in its improvement.

A kitchen of the latest design is now under construction at Patton State Hospital, containing in addition, a bakery, large cold storage plant and dining rooms for both employees and patients. These dining rooms are arranged on the cafeteria plan, an innovation

introduced into the California Institutions by the present Director of Institutions, Mr. Earl E. Jensen, and which will effect considerable saving in food. The cost of this kitchen, including equipment and bake oven, will be approximately \$150,000.

To house the employees in the way now planned, requires a large sum and for an institution with a capacity of approximately 3000 patients will probably run \$450,000. To this should be added the cost of an employees' club room, estimated at \$65,000.

An Administration Building will cost around \$60,000 and a phone system, approximately \$5,000.

The Commissary, Store and Warehouse, will probably cost \$40,000.

THE COMPLETE PLANT

The above named are only a few of the structures required by the modern hospital, a complete list would include buildings listed as follows: Receiving Building, wards for 3000 patients, two industrial buildings, assembly hall, kitchen and dining hall, employees' quarters, employees' club room, administration building, phone system, Commissary and warehouse, powerhouse, stack and shops, boilers and powerhouse equipment, cold storage and ice plant, laundry, cannery, service connections, steam, gas, electric and sewer, water system, including wells, pumps and storage, sewage disposal plant, farm buildings, etc., miscellaneous structures, roads.

GROUNDS AND FARM

For the main institution, not less than 125 acres should be allowed, in order that the buildings may not be in too close proximity, and to allow adequate landscaping of the grounds. At a conservative valuation, this land will cost not less than \$200 per acre.

The farm, which is an almost necessary adjunct to a state hospital, in that it furnishes healthy outdoor work for the patients and provides at small cost, both vegetables and fruits, dairy products, eggs, poultry and fresh meats, etc., generally comprises not less than 1000 acres of land.

PRESENT HOSPITAL POPULATION

The present inmate population of the eight state hospitals is 16,883, and it is expected that by 1939 this population will reach 22,300, an increase of nearly 33 per cent in the next ten years. Merely to plan and construct sufficient buildings, etc., to take care of this increase will involve a large amount of work on the part of the Division of Architecture.

However, in addition to this, the inmate

capacity of practically all the state hospitals today is less than the present needs, causing overcrowding and making proper segregation difficult; also making it impossible for the hospitals to accept commitment of many who should be admitted and, to correct this condition, many additional buildings will have to be constructed.

Furthermore, the provision of proper quarters for the employees at the hospitals has, in the past, been neglected to a great extent, resulting in a large labor turnover, with consequent difficulty in administration. In order to remedy this condition, a much larger construction program must now be carried out than would have been required, had suitable employees' quarters been provided in the past, as needed.

CHANGES IN HOSPITAL PLANNING

There has also been a decided change in the attitude toward and treatment of the insane and mentally affected, and, naturally, this change has influenced the planning and construction of the state hospitals.

The large three- and four-story barrack-like structures of the last century are rapidly giving way to smaller one- and two-story buildings housing from 40 to 120 patients each, so that the different types may be segregated and each type have quarters especially designed and equipped to give the maximum comfort to that type. For instance, there are now under construction or have recently been constructed, buildings designed especially for tubercular patients, patients able to work, the old and infirm, the untidy, the very disturbed, etc.

This naturally means that many additional buildings must be provided to replace old and obsolete structures and also to replace many temporary buildings built from time to time when the need absolutely required it and money for a permanent structure could not be obtained.

THE TEN-YEAR PROGRAM

From the above it is evident that the work of the Division of Architecture in planning and constructing for the state hospitals is going to be considerably increased; fortunately, a great help was given, not alone to the Division of Architecture, but also to all state agencies and state offices concerned with any or all of the state institutions, when Governor C. C. Young, in the early part of his administration, requested the Director of Public Works to have prepared a tentative building construction program to cover the next ten years. This program, the so-called

(Continued on page 26.)

Highway Work
Praised by Chamber
of Commerce

Carmel Claims First
"Scenic Reserve"

Steam Shovel Un-
covers Indian Village

Who Has Right to
Right of Way?

Clippings, Letters and Comment



Dealing With State Highways

Colonel Marshall
Talks to New York

Unusual Shade Trees
in California

Widening Work
Wins Commendation

Wasco Likes High-
way Striping

Highway Work Praised by Chamber of Commerce.

The following letter from the San Bernardino Chamber of Commerce written under date of October 11, 1929, has been received by the California Highway Commission:

San Bernardino, California,
October 11, 1929.

California State Highway Commission,
Sacramento, California.

Gentlemen:

The Board of Directors of the San Bernardino Chamber of Commerce has watched with particular interest the work being done by the California State Highway Commission, not only in this county, but throughout the state. It is apparent to the most casual observer that this is a real program of work and that the highways are being improved with some definite idea of continuity and final completion. This is a very pleasing and satisfactory situation.

It may not be amiss—occasionally at least—to advise men in public office who are trying to serve that their efforts are appreciated. Unselfish public service from public officials is accepted as a matter of course, but when the work being done by any branch of our state officials is so distinct in its accomplishment, the Board of Directors of the San Bernardino Chamber of Commerce feel that it calls for a particular expression of commendation.

Therefore, at the regular session of the Board of Directors of the San Bernardino Chamber of Commerce held this date, the president and secretary were instructed to draft this letter, adding thereto the statement that we believe that under the direction of Mr. B. B. Meek, the work on the state highways is being carried forward in an efficient manner, and that we feel we are fortunate in having his services in the position he now occupies.

Of special importance to the people of San Bernardino is the program of work on state highways now being carried on in this county, and it is evident that every consideration possible is being given to the improvement of the highways in this county and the ultimate completion of the final links in this county.

The people of San Bernardino city and of the county as a whole are also highly appreciative of the services of Mr. E. Q. Sullivan, who is in charge of this division. Mr. Sullivan is held in the very highest

esteem by our citizens, and we know that he gives his best attention to the work on hand and results are being accomplished.

Trusting that the foregoing will be considered in the spirit in which it is given, and that this Chamber of Commerce may have opportunity at some time to have the Highway Commission, its engineers, and Mr. B. B. Meek as our guests should occasion bring them to San Bernardino, we are

Yours very truly,

SAN BERNARDINO CHAMBER OF COMMERCE,
R. D. McCook, President.
R. H. Mack, Secretary.

* * * * *

Carmel Claims First "Scenic Reserve."

First honors are claimed for Carmel in the following article taken from the October 11th issue of *The Pine Cone* of that place:

Another telling shot has been fired in the fight to maintain the scenic beauty of California highways—to keep them free from the nuisance that may be summed up under the heading of "hot dog stands."

It is a shot of more than passing interest to Carmel, for it concerns the Carmel Valley Highway. This 16-mile stretch of highway is the first of a state-wide chain of scenic reserves to protect the natural beauty along California's highways.

Establishment of the first of these reserves in the Carmel Valley is announced in the latest bulletin released by the California State Chamber of Commerce.

Property owners along the Carmel Valley road, a 16-mile highway in the Monterey Bay area, have signed pledges that advertising signs will not be allowed upon their lands, according to the bulletin.

* * * * *

Unusual Trees Shade the Way in California.

The *Christian Science Monitor* of October 9th carried the following article:

HUNTINGTON PARK—The love of trees and their preservation has provided W. E. Ford, Commissioner of Streets in this city, with an opportunity of bringing verdure and beauty to an industrial

district, in the planting of more than 9000 trees since the incorporation of Huntington Park in 1908, when the city was named for the late Henry Huntington.

Twenty years ago this city was a small hamlet, and a portion of the old Cudahy Ranch. Many of the fine old trees from the walnut and orange orchards were preserved by Mr. Ford at that time until it became necessary to transplant for parks and streets with the progress of the community and the entrance of industrial concerns.

Mr. Ford, who then received his appointment of street commissioner began at once a study of trees and their adaptability to the soil of southern California. He made his selections carefully.

For the trees which must weather all sorts of conditions, especially the hot sun of this climate, providing shade for the wayfarer, he selected black acacia and the Australian umbrella because of the toughness of their roots. Fifteen hundred acacias were planted in one year.

Along the streets the "bottle" tree, a native of Australia known as the *stereculia*, were used. Much like the maples of the east, in appearance, the "bottle" tree's roots are "tapped" and will hold the moisture longer than any other tree, offering a good shade tree for southern California.

In the parks, Mr. Ford planted palms, Arizona ash, cedars, and Norway pine for beauty of sky line and shade. For color late in the autumn he planted dahlia trees that bloom only in November, scattering lavender blossoms and a faint fragrance all during the month as the rains begin.

Two old palms which once flourished on the Cudahy ranch were successfully removed 20 years ago and transplanted to the city hall park. Owing to the special care which Mr. Ford gave the little tendrils of the palm which make it one of the most difficult of trees to transplant, the two trees are vigorous and wide spreading today.

* * * * *

Widening Work Wins Commendations.

This from the *Santa Cruz News* of October 3d:

The State Highway Commission is obliged, for want of funds, to carry on further this winter the widening of the highway from Santa Cruz to Los Gatos. The Commission has certainly done splendid work in this direction thus far, and the public is appreciative of benefits received.

* * * * *

Wasco Likes Highway Striping.

The *Wasco News* of October 11th has the following to say:

The State Highway Commission will get a letter of commendation from the Wasco Exchange Club regarding the white line painted down the center of the highway from Famosa south. This action is being taken at the suggestion of C. A. Campbell, who said that the line was very helpful to night drivers.

Many members of the club agreed that this was the case. Ray Woollomes, supervisor, stated that he understood that the Highway Commission planned to paint a white line 12 inches from the shoulders of the paving too, with the object of keeping people away from the edge, and thus saving the highway.

Who Has Right to Right of Way?

Motorists who are finicky about the right of way at intersections and are inclined to "bawl out" the other driver are invited to read the latest decision of the Supreme Court in Washington on a case involving this point. The court decided that the right or preference at a crossing does not arise except when drivers are approaching at the same time and approximately the same speed. Then the one on the right has the right of way. It is no excuse to say that trees obscured the way, for this should only increase the vigilance. When a driver approaches a street intersection, and sees another approaching from his right, and near enough so that there is reasonable danger of collision if both proceed, then it is his duty to yield the right of way.

* * * * *

"Squaw Rock" Scenic Feature of New Sector.

This is from the *Redwood Journal* of Ukiah:

The favoring of the east side of the Russian River road instead of the present Cloverdale-Hopland grade promises to bring to tourists a "million dollars worth of scenery" within a few miles.

Among the high lights of scenery along the east side road is "Squaw Rock," a natural masterpiece in rock which has been encircled with a halo of mystery for years through Indian legend.

According to Indian legend, "Squaw Rock," a huge stone precipice marked by the hand of Nature with a roughly hewn stone semblance of a human countenance, was about a hundred years ago the haunt of a mysterious Indian woman—blonde, and almost an enchantress.

In the story told by remaining members of the disappearing race, the blonde Indian woman enticed Indians to their death on this rock. A cave, said to be her home, still is pointed out near the rock.

Finally, legend says, she enticed away the son of an Indian chief, and vengeful members of the tribe drove her to her doom over the towering rocks.

Therein, it is said, lies the foundation of the name "Squaw Rock," one of the old west's legend-enshrined bits of natural scenery.

* * * * *

Anti-Abbreviation Poem Was Itself Abbreviated.

It appears that the newspaper clipping reprinted in the October number of CALIFORNIA HIGHWAYS AND PUBLIC WORKS, urging that California be written in full and not abbreviated, failed to carry the last six lines of this poetic request for the proper spelling of the state's name. Mrs. Al Utter of Ukiah, author of the poetic appeal referred to, has sent CALIFORNIA HIGHWAYS AND PUBLIC WORKS a complete and authentic copy of her

poem. The concluding lines which did not appear in the clipping previously published, are as follows:

So write! Don't be lazy! This state gives one pep,
The least one can do in return is get hep
And don't cut her name down to "Cal." or "Calif."
Makes one think you might feel as though or as if
Should you write the full name some nit-wit might
scorn you;
Such a fine-looking word, too! So CALIFORNIA!

* * * * *

Secondary Highway Study Commended.

Under the heading "Progress of State Highway Work," the Redlands *Facts* editorializes as follows:

Possibly no other public enterprise looms larger in the minds of most of us than that directed toward completing our great highway system. Good roads certainly help to bring prosperity and to the construction of an adequate system, the state is committed.

At the last session of the legislature it was ordered that the Department of Public Works carry on some studies as to highways not now included in either the primary or secondary systems previously approved, with the thought in mind of later placing these roads into the latter category. Director Meek of the Department now reports the progress he is making with this work, and it appears that his Department is using due diligence in prosecuting the work.

The method of procedure has been a careful field reconnaissance with the aid of all available maps, topographical sheets, traversing the country between the designated termini, to compare all possible routes; estimates which are made up in considerable detail to cover the cost of grading mile per mile, individual bridges of any size, cost of right of way for each mile, and the cost of grading, paving and temporary surfacing where necessary.

A traffic survey in connection with the roads being studied has been going on continuously. Two density counts have been made for the entire system of stations, and the special crew which has been engaged continuously on the information count has completed two rounds of the information stations selected.

* * * * *

Talk Across Nation Without Their Voices.

This from the Napa *Register*.

Recently, two men, each equipped with an artificial larynx, engaged in a transcontinental telephone conversation.

Col. R. B. Marshall, state highway employee of Sacramento, who lost his voice through sickness two years ago, talked over 3000 miles of telephone wire to Sergius P. Grace, Assistant Vice President of the Bell Telephone Laboratories in New York. Although Grace has normal speech, he also used one of the larynxes.

Marshall thanked Grace for the gift of the larynx, a recent invention of the laboratories, which Grace promised the speechless Californian while on a trip to San Francisco last April.

Steam Shovel Uncovers Ancient Indian Village.

Frank A. Gehring, writing in the San Luis Obispo *Telegram*, tells the following interesting story:

Evidences of an early day tragedy which wiped out an ancient Indian village, were uncovered recently by a steam shovel on the San Simeon-Carmel Highway.

In making a deep cut, the shovel unearthed skeletons, tomahawks, stone mortars, and other relics of village life, and a 4-foot deep shell bed, indicating that the villagers were fishermen and had spent many years at the same spot, was uncovered. The village was on the coast, between Villa and Alder creeks.

The fact that the village had been unearthed was not discovered at once, as the material dug up was dropped down the mountain side, and it was not until some skeletons were found on the dump, that the existence of the old village was known.

According to H. L. Leventon, superintendent in charge of the highway construction, and who told of the find to Lester H. Gibson, division engineer of the State Highway Commission, the fact that all the skeletons found were in a prone position, indicating that the place dug up was a village, covered up by a landslide, and not an Indian burial spot.

It was customary for the Indians on the coast to bury their dead with their knees drawn up under their chins, and the fact that none of the skeletons found were in this position, Mr. Leventon believes, indicated that a village was covered by the falling earth from the higher hills.

The 4-foot thick bed of shells showed that the village was of considerable extent and that it has been in the same place for many years, else so deep an accumulation of shells could not have developed.

That the village was of ancient origin was indicated by the fact that nothing of a metal nature was found in the objects uncovered, and the tomahawk heads uncovered were all of chipped stone, while the wooden handles had disintegrated with time.

On one of the tomahawk heads, however, shreds of the buckskin thong which bound it to the grip, still remained.

One of the queerest of the finds was a skeleton with the skull covered by a rounded out stone mortar, such as the Indians used for grinding grain.

Whether the mortar rolled into the position during the landslide, or was placed there for some unknown purpose, was one of the mysteries of the discovery.

Besides several tomahawk heads, there were numbers of stone arrowheads, stone mortars and pestles and other relics of Indian village life. There was no pottery of any kind, however, and this was another reason for Mr. Leventon's opinion that the village was an exceedingly ancient one.

Descriptions of all the materials found were sent by Mr. Leventon to the department of ethnology, at the University of California, for possible identification, and the relics are being kept by him for further examination and study by officials of the state institution.

—

This from a boy:

"A bolt is a thing like a stick of hard metal such as iron with a square bunch on one end and a lot of scratching wound around the other end. A nut is similar to the bolt only just the opposite, being a hole in a little chunk of iron sawed off short with wrinkles around the inside of the hole."

MEASURING THE WATER CROP IN CALIFORNIA'S SNOW FIELDS

(Continued from page 2.)

sentative courses. In general the site of a snow course must be one where the snow will lie uniformly and where ground irregularities are a minimum. Usually a sheltered flat or meadow furnishes the best location. It should be of sufficient size that a fairly long "major" course and possibly a "minor" course at approximately right angles may be laid out. With courses 500 feet long or less the measurements of snow depth and water content are made at 25-foot intervals. With longer courses the interval may be 50 or 100 feet. Each course is accurately located at the angle points and ends by suitable markers placed above maximum snow depth so that on each survey the measurements will be taken at identical points as determined by tape measurements from the same initial point.

EQUIPMENT

The essential equipment in the determination of snow depth and water content at the points along the courses comprises a light jointed steel sampling tube equipped with a serrated annular cutting bit, and a scale. The tubes are made up in 5-foot sections for convenience in transportation. Narrow slots cut in the walls of the tubing provides windows through which to observe the column of snow within and through which to insert a tool for cleaning out the snow. The outside of the tubes is graduated to read in inches. The scale may be supported on the skii staff and when a core of snow has been obtained with the tube the tube and snow are weighed together by placing the tube in the supporting cradle suspended from the scale. Previously the scale pointer is set to zero with the empty tube only in the cradle, so that when the core is weighed the scale shows its weight only.

The various agencies doing snow surveying work are using many modifications of the sampling equipment as above described but there is a certain standard equipment as developed by Dr. Church and the Nevada Cooperative Survey known as the "Mount Rose Snow Sampler" which is manufactured and listed by certain instrument makers. In the California work the Mount Rose sampler has been adopted with certain minor modifications. The cutting edge on the tube of this sampler is exactly 1.5 inches in diameter and the spring scales with light aluminum case

are so calibrated that with this diameter of cutting edge the weight of core is given directly in inches of water.

PROGRAM OF WORK

As to the program for the work as now being developed, it has been stated that the scope contemplates the correlation and standardization of all work being done by present agencies and as great an extension to the unsurveyed territory as may be possible with funds available. As a working basis a skeleton selection of crest, intermediate and low level snow courses for each major stream basin in the Sierra has been adopted. With the funds available the state itself can not develop an organization to make the actual surveys. It can furnish the standard equipment and forms and provide the necessary supervision to coordinate all work. It can also share to some extent in the costs of the surveys, the construction of shelter cabins, and stocking of them with provisions, bedding, etc. The personnel and detail arrangements for and conduct of the surveys can, however, only be economically handled through cooperative arrangements with the agencies most interested in a particular stream basin.

In the contacts that have been made to date with the agencies now doing snow survey work the earnest desire to cooperate and the expressed willingness to make such changes as may be necessary to conform to "standard practice," have been most gratifying. As an example of the cooperative arrangements, the agency may have been taking only scattered single point snow depth observations over a certain portion of a stream basin. The state now asks that this work be expanded by including certain snow courses where the water content will be measured, and selects the courses. With little additional work it may also be feasible to extend the survey route to include a much needed course just over the crest in another watershed.

PHYSICAL PROBLEMS MOST DIFFICULT

In the extension of the work to fill in the gaps and supplement the present surveys the problems are not simple. Where the snow cover-runoff relation is confined to the upper basins and high altitudes the physical difficulties are of course considerable but those attendant upon the interpretation of data and analysis are comparatively slight. Coming to the lower elevations, however, and attempting to forecast run-off at foothill and valley points, the zone of early melting snow and precipitation as rain is encountered and the difficulties increase. It goes without say-

ing that the snow survey must be definitely tied in with the many precipitation stations of the U. S. Weather Bureau at the lower elevations if proper forecasts for the lower points are to be made. The state will also supplement the U. S. Weather Bureau stations by establishing precipitation stations at many locations in and adjacent to the national forests where there are permanent residents.

There are many modifying factors which must be taken into account in forecasting the run-off at a certain point from a given snow cover. The temperatures prior to and during the snowfall period as well as during the run-off period are an important consideration. Wind velocity and direction, evaporation, humidity, and soil conditions are other factors not to be neglected. To provide information as to such factors it is planned to establish certain "key" stations for the observation of fairly complete meteorological data, and in addition, a number of thermographs at strategic points.

The plans call for one complete survey at all courses about April 1st of each year for the preparation of the main forecast bulletin as of about that date. At selected stations, however, the survey will be conducted monthly or at frequent intervals to furnish data for supplementary forecasts prior and subsequent to the main forecast. Obviously, for some time, definite forecasts will only be possible for those basins or partial basins where the data from surveys conducted previous to the present time are available for purposes of comparison. Except for such locations, therefore, and until "normals" or data for yearly comparisons are developed, the bulletins can supply only the actual measurements of the surveys. With an unbroken continuation of the work for a period of years, however, it appears reasonable to anticipate valuable forecasts, not alone of the total seasonal run-off but of the monthly or periodic distribution of run-off.

The California cooperative snow survey is an activity coming under Harold Conkling, deputy in charge of water rights of the Division of Water Resources, Department of Public Works. The writer is directing the work and Spencer M. Munson has immediate charge as assistant.

LOCATION OF SNOW COURSES

The following statement shows in detail the location of snow courses, proposed, established or now surveyed, and gives the agencies cooperating in this work. Key courses are those where arrangements have been made or are proposed for surveys once a month from January to May.

Pit River

On this stream basin Mt. Lassen will be a key course with surveys made once a month, January to

May. Snow survey courses have just been established at the following places: Cedar Pass (6500 feet); Eagle Peak (7500 feet); Adin Mountains (6500 feet); Snow Mountain (5500 feet). A snow survey course is also proposed for Grizzly Peak. The surveys on the upper Pit Basin are to be made by I. M. Ingerson, in charge of the Pit River investigation of the Division of Water Resources. The Snow Mountain and Mt. Lassen courses will be surveyed through cooperation with the maintenance department of the Division of Highways.

McCloud River

Mt. Shasta is the key course for this stream basin. Snow courses are proposed for Black Fox Mountain and Mt. Hoffman.

Upper Sacramento River

Mt. Shasta is the key course and an additional snow course is proposed for China Mountain.

Feather River

The snow surveys on this stream will for the first year be confined chiefly to the North Fork with Mt. Lassen (8600 feet) and Haskins Flat (5300 feet) as key courses. There will also be a crest course proposed for Grizzly Mountains. Snow courses have just been established at Harkness Flat (6400 feet), Feather River Meadows (5000 feet), Chester Flat (4600 feet), Humbug Summit (5000 feet), Mt. Dyer (7400 feet), Fredonia Pass (6400 feet), Mt. Stover (5500 feet), Warner Creek (5000 feet), Mill Creek Flat (5800 feet), and Three Lakes (6100 feet). Snow courses are also proposed for Onion Valley, Gold Lake, Table Mountain and Cammel Peak. The Great Western Power Company is cooperating in the surveys on this stream basin, that lie in the vicinity of its Almanor and Bucks developments.

Yuba River

La Porte, Lake Fordyce and Summit will be the key courses on the Yuba watershed. Other courses have been surveyed in previous years at Webber Peak (8000 feet); Bowman Lake (5630 feet); English Mountain (7100 feet); Findley Peak (6500 feet); Lake Spaulding (4800 feet); Cisco (5700 feet); Furnace Flat (6600 feet); Sawmill Flat (7000 feet); Lake Sterling (7000 feet); Red Mountain (7200 feet) and Meadow Lake (7200 feet). Courses have just been established at Jackson Meadows (6200 feet) and Haypress Valley (6800 feet). A course is also proposed for Gold Lake Ridge. The La Porte course is also a new one. Cooperating agencies on this watershed are the Pacific Gas and Electric Company, The Nevada Irrigation District, and the Nevada Cooperative Surveys.

Truckee River

Key courses on this stream basin are Summit (7019 feet) and Mt. Rose (10,000 feet). Other courses already established are Truckee (5800 feet); Boca (5600 feet); Crystal Peak (770 feet); Big Meadows (8700 feet). These courses have been surveyed for many years. Cooperating agencies are the Pacific Gas and Electric Company and the Nevada Cooperative Surveys.

Lake Tahoe

Mt. Rose with an elevation of 10,000 feet is the key course on this stream basin. Other courses, all of which have been surveyed for many years are Marlette Lake (8000 feet); Daggetts Pass (7500 feet); Freel Peak (8300 feet); Lake Lucille (8700 feet); Rubicon Peak (8000 feet); Ward Creek (7000 feet); Tahoe City (6200 feet). A new course has been established at Myers (5400 feet). These surveys are conducted through the Nevada Cooperative Survey.

American River

Silver Lake (7300 feet) and Summit (7019 feet) have been selected as the key courses. Other courses that have been surveyed are Cisco (5700 feet); Ward Creek (7000 feet); and Lake Lucille (8700 feet). Courses just established are located at Sixmile Valley (5700 feet); and Carson Pass (8600 feet). Courses are also proposed for Duncan Peak, Gerle and Union Valley. Pacific Gas and Electric Company and the Nevada Cooperative Survey are cooperating agencies.

Carson River

Blue Lakes (8000 feet) is the key course. Other surveys will be conducted at Williams (7800 feet); Burnside Lake (8000 feet); Grovers Springs (6200 feet) and Silver Peak (6800 feet). These surveys are conducted through cooperation with the Pacific Gas and Electric Company and The Nevada Cooperative Surveys.

Mokelumne River

Blue Lakes (8000 feet) is the key course. Other surveys will be conducted at Pacific Valley (7500 feet) and Bear Valley Ridge (6700 feet). The Pacific Gas and Electric Company is the cooperating agency.

Stanislaus River

Niagara Flat (6500 feet), Strawberry Lake (5700 feet) and Lake Alpine (7500) feet have been designated as key courses. Courses just established are located as follows: Kennedy Meadows (7600 feet); Sonora Pass (9200 feet); Relief Dam (7300 feet); Pacific Valley (7500 feet). Proposed courses are Eagle Meadows, Bloods, Duck Lake and Clover Meadow. Cooperating agencies are The Nevada Cooperative Surveys and Pacific Gas and Electric Company. The Pacific Valley course is in the Mokelumne basin but is close to the Stanislaus divide.

Walker Pass

Courses have been surveyed for a number of years on this stream basin. The present work will be carried on in conjunction with the Nevada Cooperative Surveys. The courses follow: Sonora Pass (9200 feet); Pickle Meadow (7200 feet); Pickle-Leavitt Bench (7000 feet); Leavitt Meadow (7200 feet); Willow Flat (8300 feet); Buckeye Hot Springs (6900 feet); Buckeye Creek (8000 feet); Buckeye Forks (8500 feet); Center Mountain (9300 feet).

Tuolumne River

Strawberry Lake (5700 feet), Kibbe Ridge (6500 feet), White Wolf (8000 feet), and Tioga Pass (9900 feet) are the key courses on this stream basin. Other courses at which snow surveys will be conducted are Center Mountain (9300 feet); Dana Meadows (9700 feet); Dorothy Lake, Benson Lake, Wilmer Lake, Lyle Fork (8000 feet); Tuolumne Meadows (8600 feet); White Wolf (8000 feet), Fletcher Lake (10,300 feet); Beehive (6500 feet) Gin Flat (7100 feet). Cooperating in these surveys are The Nevada Cooperative Surveys, the Pacific Gas and Electric Company, Southern Sierra Power Company, Yosemite National Park, Turlock and Waterford Irrigation Districts, and the city of San Francisco.

Merced River

Snow Flat (8700 feet) and Merced Lake (7200 feet) are the key courses. Other courses are located at Gin Flat (7100 feet); White Wolf (8000 feet); Lake Tenaya (8100 feet); Fletcher Lake (10,300 feet); Isberg Pass (10,000 feet); Perego Meadow (7100 feet); Moraine Meadows (8700 feet); Wawona Point (6700 feet); Crescent Lake (8500 feet). Cooperating agencies are the Yosemite National Park and the Merced Irrigation District.

Mono Lake

Courses on this basin have been surveyed for a number of years. All courses except Davis Lake are surveyed monthly from January 1st. Courses are located as follows: Tioga Pass (9900 feet); Rhinodollar Lake (9500 feet); Saddlebags Lake (10,000 feet); Sylvester Meadows (7500 feet); Davis Lake (10,000 feet); Gem Lake (9200 feet); Silver Lake (7300 feet); Grant Lake (7200 feet). The Southern Sierra Power Company is the cooperating agent.

San Joaquin River

Darwin Creek (11,000 feet); Mammoth Pass (9500 feet) and Florence Lake (7200 feet) are the key courses. Established courses on this stream basin are Agnew Pass (9500 feet); Piute Pass (11,200 feet); Huntington Lake, Kaiser Pass, Burnt Corral Meadow (9700 feet); Chilkoot Lake (7500 feet) and Blackcap Basin (10,500 feet). Proposed courses are Isberg Pass (10,000); Reds Meadow (7700 feet); Mono Creek Pioneer Basin (11,000); Jackass Meadow and Hoffman Meadow. Burnt Corral Meadow and Blackcap Basin are in the North Kings Basin but close to the San Joaquin divide. Darwin Creek is in Bishop drainage, but also close to the San Joaquin divide. Cooperating agencies are The Southern Sierra Power Company, the Yosemite National Park, the city of Los Angeles, the San Joaquin Light and Power Company and the Southern California Edison Company.

Owens River

The snow courses on this stream basin are located on Mammoth, Rock, Bishop, Big Pine and Cottonwood creeks. All of these courses have been surveyed for three or more years. Key courses are Mammoth No. 1 (9500 feet); Darwin Creek (11,100 feet). Other courses included in the survey are Mammoth No. 2

(8300 feet); Minarettes No. 1 (9000 feet); Minarettes No. 2 (8300 feet); Rock Creek No. 1 (10,000); Rock Creek No. 2 (9,050 feet); Rock Creek No. 3 (8700 feet); Lamark Creek (10,500 feet); Blue Lake (10,300 feet); Sawmill (10,200 feet); North Lake (9500 feet); South Fork (8000 feet); Bishop Park (8500 feet); Big Pine Creek (8900 feet). These surveys are conducted by the city of Los Angeles and the Southern Sierra Power Company.

Kings River

These surveys will include snow observations on the North Fork, the Middle Fork and the South Fork of the Kings River watershed. Single point observations have been made in past years, but snow courses have just been established. The key courses selected are Cliff Camp (6300 feet); Sand Meadow (8100 feet) and General Grant Park (6660). Other courses have been located at Statum Meadow (8300 feet); Wood chuck (9000 feet); Beard Meadow (9700 feet); Blackcap Basin (10,500 feet); Post Corral (8300 feet); Long Meadow (8400 feet); Burnt Corral Meadow (9700 feet); Helms Meadow (8500 feet); Swamp Meadow (9000 feet); Dinkley (5600 feet); Bear Ridge (7200 feet); Fred Meadow (7000 feet); Bishop Pass (11,400 feet); Moraine Meadow (8400 feet); Rowell Meadow (9200 feet); Horse Corral Meadow (7600 feet); Kennedy Meadow (7600 feet) and Big Meadow (7600 feet). Courses are proposed at Woods Lake and Bullfrog Lake. Cooperating agencies are the San Joaquin Light and Power Corporation, the Southern Sierra Power Company, General Grant and Sequoia National Parks, Tulare Lake Water Storage District and Fresno office of the U. S. Weather Bureau.

Kaweah River

No courses have been established on this stream basin to date. Proposed key courses are Mineral King and Giant Forest. Other proposed courses are J. O. Pass, Lone Pine Meadow, Redwood Meadow, Hockett Meadows and Columbine Lake. A course is established at Big Meadow (7600 feet) which is in the South Kings Basin but very close to the Kaweah divide. For the Big Meadow Survey the cooperating agencies are the Tulare Lake Water Storage District, and General Grant and Sequoia National parks.

Kern River

A proposed course at Whitney Meadows, and established courses at Monache (8000 feet), Round (9000 feet) and Cannel Meadows (7500 feet) constitute the key courses on this watershed. Other established courses are Burnt Corral (6200 feet); Lloyd Meadows (5500 feet); Little Whitney (8500 feet); Ramshow Meadows (8700 feet); Casa Vieja Meadows (8500 feet); Bench Meadows (7800 feet); Windy Springs (6200 feet) and Bonita Meadows (8500 feet). Courses are proposed at Sand Meadows, Columbine Lake, Moraine Lake, Rock Creek-Army Pass and Wet Meadows. Some observations have been made in previous years at Windy Springs and Monache Meadows. On these surveys the cooperating agencies are the Kern County Land and Water Company, Miller & Lux and The Buena Vista Water Storage District. There is a proposed cooperation with the Southern California Edison Company and the city of Los Angeles.

How it All Came About

First I got tonsillitis, followed with appendicitis and pneumonia.

After that I got erysipelas with hemochromatosis. Following that I got polymyositis, and finally ended up with neuritis. Then they gave me hypodermics and inoculations.

No, sir, I thought I never would pull through that spelling test!—*New Yorker*.

Down in Houston, Texas, a man has discovered that danger signs are based on the wrong psychology. He says tell a man to "Stop, look, listen," and he is impelled to do none of the three. He suggests for railroad crossings:

"Come ahead. You're unimportant."

"Try our engines. They satisfy."

"Don't stop. Nobody will miss you."

"Take a chance. You can get hit by a train only once."

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

B. B. MEEK-----Director
GEORGE C. MANSFIELD-----Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 7 NOVEMBER, 1929 No. 11

Autos to Create New Type of City Declares Babson

ROGER W. BABSON, writing in the *Boston Transcript* describes the city of the future as follows:

The city of the future will look entirely different from the city of today. One of the first measures, I believe, will be street widening through elimination of sidewalks. Pedestrian traffic in the cities will be underneath arcades. This can be done by tearing away a portion of the lower floor of buildings and by supporting the street walls up to the second story on pillars, and utilize as sidewalks the space underneath which was formerly a part of the first floor. The former sidewalks will be part of the streets. Overhead passes across streets for pedestrians will be almost universal. Great arterial highways will go through the center of our cities. These will be supplemented by smaller high-speed highways around the outskirts of the central business district. The city of the future will also be more decentralized than at present. It will spread out into what are now suburbs. Already many big department stores are establishing branches in a wide suburban area. The purpose is to reach those customers who, because of traffic congestion, are unable or unwilling to patronize the central store. This decentralization and expansion process is expensive. In time it will hurt the value of the centrally located city property; but it will increase the value of suburban business property. The reason why down-town property is more valuable than any other is because the most people pass there on foot. If foot travel becomes so dangerous or so slow in these areas that it diminishes in volume, then the value of such property will diminish.

One important reason why the automobile has caused so much congestion is that many of our cities were allowed to grow as they started; namely, along the lines of old cart paths. It is a vast and expensive undertaking to straighten and widen crooked and narrow streets. However, that is being done and will be done on a much larger scale in the future. City governments should take care, however, that future expansion is along sensible lines, and in accordance with a comprehensive and thoroughly unified traffic plan. Before starting new projects the advice of expert engineers and traffic authorities should be obtained. Otherwise much money can be wasted without accomplishing any real improvement.

78,800 Miles Highway Constructed Under U. S. Program

A TOTAL of 78,797.6 miles of federal aid highways had been completed August 31, according to figures compiled and made public on October 7 by the Bureau of Public Roads.

Three states having the highest amount of federal aid roads completed on that date, according to the bureau, were: Texas, 6141.1 miles; Minnesota, 3854 miles, and Nebraska, 3559.4 miles.

Two states and a territory having the lowest mileage completed were: Rhode Island, 172.1 miles; Delaware, 212.9 miles, and Hawaii, 172.1 miles.

A total of 10,321.7 miles, of which 8724.4 were initial, and 1597.3 were stage, was under construction at a total estimated cost of \$259,691,965.90, and with a federal aid allotment of \$104,613,910.33.

Texas had the largest mileage, 966, under construction; North Dakota was second, with 561.6 miles, and South Dakota third, with 546.1 miles.

Hawaii, with 6.6 miles under construction; Connecticut, with 12.5 miles under construction, and Rhode Island, with 17.1 miles under construction, were lowest in mileage.

A total of 2347.6 miles at a total cost of \$50,731,365.23 and a federal aid allotment of \$19,839,505.36 was approved for construction on August 31, the bureau said.

Of the total mileage approved for construction, according to the bureau, North Dakota had the largest mileage, 288.2; Montana next, 221.8 miles, and Kansas third, 157.5 miles.

Three states having the smallest mileage approved for construction were: Mississippi, 0.1 mile; Rhode Island, 1.5, and Massachusetts, 5.

There remained a total of \$41,566,632.59 as a balance of federal aid funds available for new projects, according to the bureau.

Six states having the largest balances of federal aid funds available for new projects, according to the bureau's figures, were: New York, \$3,679,100.66; Montana, \$2,724,032.48; Illinois, \$2,606,225; Arizona, \$2,133,114.66; Georgia, \$2,023,796.56, and Alabama, \$1,969,823.58.

JAPANESE "RULES OF THE ROAD AND HINTS TO MOTORISTS"

(1) At the rise of the hand of policeman, stop rapidly. Do not pass or otherwise disrespect him.

(2) When passenger of the foot hove in sight, tootle the horn. Trumpet melodiously at first. Then tootle with vigor, and express by word of mouth the warning, "HII! HII!"

(3) Beware of the wandering horse that he shall not take fright. Go soothingly by.

(4) Give space to the festive dog that makes sport in the roadway. Avoid entanglement of the dog with your wheel spokes.

(5) Go soothingly on the grease-mud as there lurks the skid demon. Press the brake of the foot as you roll round the corners to save the collapse and tie-up. —Clipped.

There is now a positive means of distinguishing between the male and female worm. The latter makes no signal when turning.

CARELESS FAULTS OF CAREFUL DRIVERS

(Continued from page 7.)

Too many people are driving fast and going nowhere. A few days ago a car passed me at breakneck speed on a narrow mountain road. I overtook it only a quarter of a mile ahead, parked alongside the road with the family preparing for a picnic lunch!

Upon inquiry I learned this family was staying at a resort less than five miles away and had all day to make the trip. Why that driver was risking the lives of all in the car merely to get nowhere particularly is incomprehensible.

"GOING NOWHERE IN A HURRY"

Every one has witnessed the spectacle of drivers dodging madly into and out of traffic in the cities and has jogged along and caught up with these same drivers at the next automatic signal. Simply another case of going nowhere in an awful hurry.

Most careful drivers are extremely punctilious about the manner in which they give the hand signals. Yet I have noticed a great many who pride themselves on being careful, who do not give the right turn signal at all except in the presence of a traffic officer.

Although not as important as the left turn signal, it is, nevertheless important. It is particularly so at intersections where pedestrian traffic is heavy for it lets the pedestrian know what the driver is going to do.

SLOPPY SIGNALS

Some otherwise careful drivers give the left turn signal in a very sloppy manner. Many apparently think it is sufficient to poke the arm out of the window, making it impossible for those behind to tell whether the driver is merely slowing down or going to make the turn. A very large number give the signal entirely too late.

Cutting the corners is another practice of many "careful" drivers. It's an easy habit to get into, especially at intersections where traffic is light. If indulged in continuously, it is sure to get the driver into trouble, sooner or later.

Following too close is another bad habit indulged in by a lot of otherwise careful persons. Our records show it causes a very large percentage of the accidents in the crowded cities.

HEADLIGHT NUISANCE

The glaring headlight nuisance is largely the fault of the driver who thinks he is care-

ful. If every man who swears and raves about the many glaring lights he meets on the road would take the trouble to examine his own lights, the nuisance would disappear over night.

Lights should be checked often. A good heavy jar will sometimes throw them out of focus. So the careful driver can never be sure he has anything to brag about concerning his lights unless he checks them up regularly. Walk about a hundred feet up the road some night, take a look at your lights and judge for yourself.

During the last six months our officers have stopped more than 30,000 persons with glaring lights. Almost invariably it was a complete surprise to the driver to find out that his lights were out of focus.

WATCH THE DETAILS!

You can't neglect the little things and be a careful driver. Some otherwise careful persons let dirt and mud collect on the lens of their rear lights until they are almost obscured. Others neglect to check the connections and drive for miles without a rear light until stopped by some officer.

Most careful drivers turn their lights on early in the evening as dusk approaches. Others do not however and accidents are frequent particularly accidents involving pedestrians. Our records show a very large percentage of accidents occur in the "half-light" period just before dark.

Don't be afraid to turn on your lights. If your battery is low speed up your generator a bit.

A most common fault of nearly all who believe they can handle a car well is that they travel too much over crooked mountain roads on the down-grade with their cars in high gear. They make a little better time that way but are compelled to use their brakes constantly.

USE LOWER GEARS

It is very dangerous to use the brakes to their full capacity when a car is traveling with any degree of speed in sand or gravel. The wheels lock and the car is very likely to skid to one side. Low and intermediate gears are meant for just such situations. Why not make use of them?

It is very possible that few if any of us are 100 per cent careful drivers. Many drive according to their moods; today careful and watchful, tomorrow reckless.

Few serious accidents happen to the initiate driver. It is the old-timer who thinks he can drive well and perhaps he can. But he can no more afford to take chances than the novice.

High Points in October Awards

IMPROVEMENTS of alignment, the replacement of unsatisfactory bridges, the elimination of danger points, widening and surfacing of old highways, together with new work of major importance are provided in state highway contracts awarded during October. The following statement gives the nature of the work included in the various contracts:

OLD TRAILS HIGHWAY—A contract awarded October 1, 1929, provides for grading and surfacing with oil-treated crushed gravel or stone a section of the Old Trails Highway situated between a point 2 miles west of Argus and a point $1\frac{1}{2}$ miles west of Siberia in San Bernardino County. This section is 19.5 miles in length. The surfacing is to be 20 feet in width. Drainage ditches and bridges are to be constructed to protect the road bed from cloudbursts. This project parallels the Santa Fe Railroad from the east into California. It will replace the present unimproved desert road, and is a continuation of the work now under way from Daggett easterly. The contract was awarded to the New Mexico Construction Company, Inc., of Denver. The contract price is \$368,022.10.

Another contract on this same road was awarded to the same company at a contract price of \$384,535.40. This second contract covers a section situated between points $1\frac{1}{2}$ miles west of Siberia and 6 miles east of Amboy. It provides for grading and surfacing this stretch of highway, 22.4 miles in length, with oil-treated crushed gravel or stone. The surfacing is to be 20 feet in width. Storm ditches, dykes and timber trestles for protecting the roadbed from cloudbursts



The Mother Lode Highway is seeing its first construction. This view shows a completed graded section in Calaveras County south of Mokelumne Hill.

are also to be constructed. This project lies in a desert country east of Barstow.

PACIFIC HIGHWAY—A contract was awarded to H. E. Doering of Portland, Oregon, to construct a steel deck truss bridge across the Shasta River in



WHEN PUSHING A PLANIMETER IS A PLEASURE.

Siskiyou County about 6 miles north of Yreka. This bridge will have one 139-foot suspended span, two 138-foot cantilever arm spans, two 138-foot anchor arm spans on concrete piers and abutments. The clear width of bridge roadway will be 24 feet. The deck is to be 260 feet above the river bed. This bridge is the second crossing of the Shasta River north of Yreka and is a portion of the realignment through the Shasta River Canyon. The contract price is \$190,368.50.

The contract for constructing a reinforced concrete girder bridge across the Coon Creek overflow in Placer County was awarded to C. C. Gildersleeve of Napa. The structure will consist of a 20-foot span on concrete abutments with wing walls. The contract also provides for grading and paving the approaches with Portland cement concrete. The contract price is \$8,738.50.

A contract for furnishing, hauling and placing untreated crushed gravel or stone surfacing on the section in Tehama County, between the Butte County line and Red Bluff, was awarded to Hemstreet and Bell of Marysville. The contract price is \$11,137.80.

A contract for widening about 6.9 miles altogether of roadbed in Colusa County was awarded to C. R. Merrill of Williams. The roadbed is to be increased to a width of 26 feet. The contract price is \$11,251.68.

REDWOOD HIGHWAY—A contract providing for grading and paving with Portland cement concrete and bituminous macadam 1.8 miles of highway between Gallinas Creek and San Rafael in Marin County was awarded to Granfield, Farrar and Carlin of San Francisco at a contract price of \$133,231.75. The plans call for concrete paving partly 20 feet in

width and partly 30 feet in width. This project eliminates some particularly bad alignment and blind curves. It also shortens the route some 1600 feet. The new alignment crosses the Northwestern Pacific Railroad near Forbes, at which point an overhead structure will be built under another contract.

A contract was awarded to Smith Brothers of Eureka to place perforated metal pipe underdrains between Elk Valley and a point $1\frac{1}{2}$ miles south of Smith River in Del Norte County. This work is made necessary by the heavy rains that occur there. The contract price was \$16,346.24.

E. C. Coats of Sacramento was awarded the contract for grading and surfacing with untreated crushed gravel or stone a section of highway between Fish Creek and Stevens Grove in Humboldt County. The surfacing is to be 20 feet in width. The road will be constructed on a new alignment that eliminates many sharp curves on the present rather crooked road. The contract price is \$130,767.60.

The contract for constructing a reinforced concrete bridge across San Antonio Creek in Sonoma and Marin counties was awarded to McDonald and Maggiora of Sausalito, the contract price being \$20,035. The bridge will have three 40-foot spans on concrete abutments with a clear roadway width of 34 feet.

GOLDEN STATE HIGHWAY (Valley Route)—McCray Company of Los Angeles were awarded a contract for grading and paving with Portland cement concrete a section of highway 1.1 miles in length between Newhall Tunnel and Newhall in Los Angeles County. The roadbed is to be graded to a width of 40 feet and the pavement is to be 20 feet in width. This project will improve the unsatisfactory alignment now existing immediately north of the tunnel. The contract price is \$69,087.24.

A contract providing for the removal and disposition of the old Herndon Bridge in Fresno and Madera counties was awarded to William Wilcox of Selma at a contract price of \$1,800.

A contract for the construction of a reinforced concrete girder bridge across Cottonwood Creek in Madera County was awarded to George G. Wood of Fresno at a contract price of \$28,962.50. The plans for this bridge called for six 33-foot spans on concrete pile bents and concrete abutments with wing walls on pile foundations. The width of roadway is 32 feet and a 5-foot sidewalk is provided. This new bridge will replace the present dilapidated structure built by the county some years ago.

M. B. McGowan of San Francisco was awarded a contract to construct two timber bridges across French Camp Slough in San Joaquin County. These two timber trestle bridges built in pile bents will have 8 and 11 spans respectively, these spans having a uniform length of 19 feet. The roadway will be 34 feet in width. These bridges are on a new right of way and provide a new entrance to Stockton along McKinley avenue. The contract price was \$23,543.50.

RED BLUFF-SUSANVILLE LATERAL—A contract for surfacing 28.7 miles between Paynes Creek and Morgan Springs in Tehama County was awarded to A. F. Giddings of Sacramento at a contract price of \$95,757.50. The surfacing is to be of untreated crushed gravel or stone, 18 feet wide.

COAST HIGHWAY—Matich Brothers of Elsinore were awarded a contract for grading and paving about 0.2 of a mile west of San Clemente in Orange County. The pavement is to be Portland cement concrete. The contract price is \$8,872.75.

A contract for grading and paving with Portland cement concrete 1.5 miles at San Ardo in Monterey County was awarded to Fredrickson and Watson and

THAR'S BEAR IN THEM HILLS



This black bear was trapped on October 12, 1929, by convicts and free employees at Camp 19, in Indian Basin, near General Grant Park. The bear measured 7 feet 11 inches from tip to tip.

Fredrickson Brothers of Oakland. This project includes the bridge approaches at San Ardo and 0.74 of a mile of line revision south of San Ardo. This revision of alignment will eliminate several short radius curves. One of these curves, located in a deep cut, has caused numerous accidents. The road will be shortened 960 feet. The width of pavement will be 20 feet. The contract price is \$95,450.30.

MOTHER LODGE HIGHWAY—Adams Company of Angels Camp was awarded a contract to surface with screened gravel 2.2 miles of highway south of Mokelumne Hill in Calaveras County. The contract price is \$8,738.50.

SAN SIMEON-CARMEL HIGHWAY—A contract to construct a timber bridge across Villa Creek in Monterey County about 23 miles north of San Simeon was awarded to H. C. Whitty of Sanger. This bridge will have ten 19-foot spans on frame bents with concrete pedestals. The roadway of the bridge will be 24 feet in the clear. This bridge is on a section, the

grading work of which is being done by convict labor. The contract price is \$11,644.

PLACERVILLE-TAHOE HIGHWAY—A contract for surfacing a section of highway extending from Logtown to a point 3.8 miles south in El Dorado County was awarded to Hemstreet and Bell of Marysville. The contract price is \$11,750.

TRINITY LATERAL—The construction of a steel deck truss bridge across the South Fork of the Trinity River about 2 miles west of Salyer in Humboldt County was awarded to the Mercer-Fraser Company of Eureka. This bridge will consist of one 240-foot span, two 80-foot cantilever arms and four 20-foot steel stringer approaches. It will replace the present bridge which is considered both narrow and dangerous. The contract price is \$97,650.

LOS ANGELES-OWENS VALLEY HIGHWAY—Fred W. Nighbert of Bakersfield was awarded a contract for grading and surfacing 3.7 miles between Little Lake and Coso Junction in Inyo County. The road is to be surfaced with oil-treated gravel. The contract price is \$63,297.69.

HOW CALIFORNIA PLANS ITS HOSPITALS

(Continued from page 15.)

10-year building construction program, was presented to the legislature by the Governor in the budget for the eighty-first and eighty-second fiscal years.

For the first time in the history of California, this 10-year building program set forth the needs of the state institutions during the next decade, in order not only to provide for their natural growth, but also to remedy the present needs as stated above. The 10-year building program proved that this could be accomplished within the funds that could reasonably be expected to be made available for expenditure for construction purposes during succeeding bienniums for the next ten years.

In connection with this program, the Division of Architecture prepared plot plans of all state institutions showing all existing buildings, and the location of all proposed buildings required at each institution, to properly house and care for all inmates and employees, which will be within its borders at the end of the 10-year period.

ORDERLY GROWTH ASSURED

By thus planning ahead, all the state institutions are assured of an orderly growth, equal to the demand made upon them and the Division of Architecture is enabled to solve and plan such problems as roads and walks, steam distribution, water supply and irrigation systems, electric and gas service, sewer systems and disposals, in the most economical way, and have construction of them carried out in logical sequence.

THE BAYSHORE HIGHWAY DEDICATION

(Continued from page 10.)

steps should be taken to carry the pipe line across the slide area. This was done by the construction of a suspension bridge 165 feet in span. The night after the suspension bridge was completed and the pipe line was supported thereon, the ground beneath the line dropped vertically about 10 feet. Had this taken place a day earlier most serious consequences might have ensued.

On several sections fills running upward of 50 feet in height across tidelands produced displacements of the surrounding marsh extending, in extreme cases, to over 300 feet beyond the toe of the slope. Drops from 8 to 15 feet within a short time were common experiences. In these lateral movements of the soil, great quantities of fill material were carried on the crest of the moving ground to the extreme limits of the movement.

A sound method of building drainage structures developed and used in this district to overcome difficulties encountered on marsh flats and sliding hillsides were successfully applied during the execution of this contract. In the case of pipes and structures the fill was first made and the maximum settlement procured and then re-excavated for structures. If minor structures had been placed first, they would have been totally wrecked and rendered useless. In the case of larger structures the fill was first made, piles were then driven through the fill by means of followers to somewhere near cut-off; fills were then excavated and heavy concrete mats built on pile foundations after which side walls and tops were placed.

The opening to traffic of the state's 12.9 miles of the Bayshore Highway, augmented by the 3.1 miles inside of the city and county of San Francisco, provides 16 miles of high standard commodious road and with funds budgeted for the purpose there will shortly be added two new sections, San Mateo to Redwood City and Redwood City to Embarcadero road, Palo Alto, a distance of 14 miles.

Following the construction to Palo Alto it is expected that the remaining 14 miles necessary to reach San Jose, will be constructed as rapidly as funds will permit.

The meek-looking woman with shell-rimmed spectacles was applying for a driver's license.

"How many miles have you driven?" asked the official.

"Fifty thousand miles—and never had hold of the wheel!" interposed her husband, stepping up.

She got the license.—*Detroit Motor News.*

Validity of 1929 Dam Law is Upheld

1 1 1 1 1 1

THE constitutionality of the legislative act of 1929 increasing the power of the State Engineer over dam structure built or repaired in California was upheld in a sweeping decision rendered by the Third Appellate District on October 25, 1929.

The case arose over the application for a writ of mandate directed against the auditor of the city of Stockton to require him to issue a warrant to Brent Brothers, Inc., for work done under a contract for the construction of a flood control dam.

After the new law became operative, certain modifications in the plans were demanded by the State Engineer in accordance with the duties imposed upon him by the act of 1929. These changes were accepted and the dam built in accordance with the requirements imposed by the State Engineer. The auditor of the city of Stockton refused to draw his warrant in favor of the contractors on the ground that the plans for the construction of the flood control dam had been changed to such an extent that it voided the contract under which the contractors were seeking compensation.

BASIS OF DECISION

The decision of the court was awaited with great interest, inasmuch as the proceeding involved the constitutionality of the act. The following excerpts from the decision, bearing upon this subject, will be of interest. We quote as follows:

"The first suggestion which we will consider is the unconstitutionality of the act in that it is in violation of the constitutional provisions of this state and of the United States relative to the impairment of contracts; and, also, that it confers upon the State Engineer arbitrary powers enabling him to adopt rules and regulations which, if violated, subjects the violator to a penalty of \$2,000 or imprisonment in a county jail not exceeding six months, or both. While the act referred to does not, by its terms, define of what material any dam shall be constructed, whether of concrete, whether of rock-filled dam, or whether partly of concrete and earth filling, or of rock filling, it does provide for the inspection of any proposed dam and the making and proposing of amendments to any plans or specifications for the erection of a dam. As we read the act there is nothing which authorizes the State Engineer to directly require the construction of a dam according to any particular plans or specifications, nor does the act authorize the State Engineer to make any material alterations in any contract which has been entered into between an owner and contractor for the construction of a dam. But while the act does not, in

terms, directly authorize the State Engineer to do what we have mentioned, it does indirectly give him power to enforce his recommendations and suggestions by enabling him to begin actions to enjoin and restrain the construction or maintenance of any dam not constructed or repaired according to approved plans and specifications, and through the medium of the court affect the safety of persons and property living below the point or place of the construction of the dam, and the creating of a reservoir which might become a menace to the property and lives of persons in the course which the impounded waters would take in the event the proposed structure proved inadequate to withstand the pressure of the impounded waters. We do not need to pass upon the question as to the validity of section 17 of the act referred to for the simple reason that if it should be considered void under the reasoning of the case of *Schaezlein vs. Cabuiss*, 135 Cal. 466, 469, no other portions of the act are thereby affected. Section 18 of the act authorizing the State Engineer to institute actions by way of mandamus or injunction puts teeth enough therein to make all the reasonable mandates of the State Engineer effective. While not so denominated, the act is purely a police regulation and must stand or fall as so considered.

A brief definition and statement will show the validity of the act as a police regulation and proper exercise of the sovereign power of the state. * * * The police power of the state differs materially from the powers of eminent domain. In eminent domain one's property can be taken for public use only upon just compensation. Under the police powers it may not simply be taken, but destroyed without any compensation, depending upon the statutes of the state. Again: "The police power is an attribute of sovereignty, and exists without any reservation in the Constitution, being founded upon the duty of the state to protect its citizens and provide for the safety and good order of society. It corresponds to the right of self-preservation in the individual, and is an essential element in orderly government. * * * It has for its object the improvement of social and economic conditions affecting the community at large, and collectively, with the view of bringing about the greatest good to the greatest number. On it depends the security of society, order, the life and health of the citizen, the comfort of existence, the enjoyment of private life and beneficial use of property." That the police power of the state to supervise and regulate the construction and maintenance of dams impounding large bodies of water, remained unexercised until the disastrous consequences following the breaking of the St. Francis dam in the southern part of the state, is no argument against its existence, but the experiences attending the breaking of that dam emphasize the necessity for, and the constitutionality of the police powers being extended to, and including such structures in order that the safety of persons and property may be conserved. (1) With these statements as a premise, we think the conclusion clearly follows that the act of the legislature approved June 10, 1929, is constitutional in all its essential provisions, as not only a proper, but as a necessary exercise of the police power of the state. A limited number of authorities only need be cited. (Citations follow.)

While differing in the circumstances presented, the principle is the same. (2) The conclusion, therefore, follows that while the act under consideration does not authorize the State Engineer to make a material alteration in the plans and specifications for the construction and maintenance or repair of any structure coming within the purview of the language used in section 2 of the act approved June 10, 1929, defining dams, it does authorize the State Engineer to prevent by injunction, suits or other appropriate court procedure, the erection or maintenance of any structure impounding waters in such a manner as to create a menace to the safety of persons and property living and being along the course where such impounded waters would flow if suddenly discharged. In other words while under the constitutional provisions we may admit that the State Engineer can not impair the obligations of contracts, he can maintain suits to prevent contracts from being so executed and performed as to create a menace to life and property."

CHANGES MADE BY STATE ENGINEER

The changes made by the State Engineer in the plans and specifications for the structure are outlined in the decision as follows:

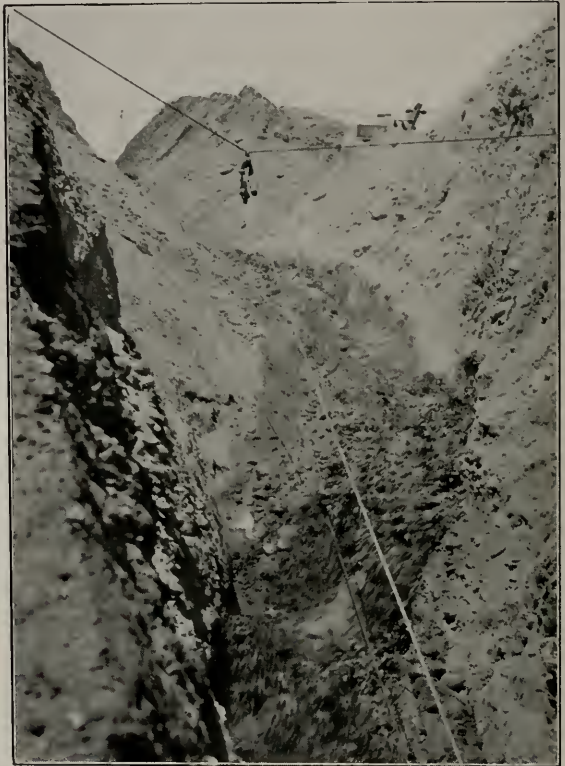
The change in the plans and specifications adopted by the city of Stockton, as made by the State Engineer, involved decreasing the radius of the arch section and varying the radii for the horizontal arch sections in length from the base to the crest of the dam. The height, capacity, general location and general type of the dam were not changed. The location of the central portion of the arch was moved up-stream about 50 feet, and the left abutment down-stream approximately the same distance. No considerable lateral displacement was made in the central mass of the dam. The quantity of foundation excavation required was about the same as specified in the original plans. The quantity of concrete required to make the necessary changes was increased about 10 per cent above that estimated under the original plans. No material modification of the gravity section abutments are involved in the proposed changes. No change is made in spillway, outlet or flood control works, nor in the specifications regarding construction.

Further findings of the court are given in the syllabus as follows:

"In this proceeding for a writ of mandate to compel a city auditor to issue a warrant for work done under a contract for the construction of a dam, where defendant's bid for the work was accepted and an estimate as to the amount of the materials to be used was made and the contract provided a certain price to be paid per unit, and certain alterations in the plans and specifications for the erection of the dam were made in accordance with the recommendations of the State Engineer, made under the power given him by the act regulating the construction of dams (Stats. 1929, p. 1505), which alterations caused a slight increase in the total price to be paid for the construction of the dam, it is held that the unit price method adopted under the contract made it unnecessary for the city to call for new bids for the increased amount of work and that section 1 of article XXIII of the Stockton city charter, which provides that contracts for work in excess of \$1,500 can only be let after bids being received therefor, was not violated by permitting petitioner to perform the additional work required even though no new contract therefor was made.

"Where unseen emergencies arise after the letting

WATER HYDRAULICS OUT CUT; SLUICES FILL



The above pictures show construction of a 70-foot fill on Force-Curigan & McLeod's job east of Bakersfield, on the Kern River route. The fill was about 70 feet in height and the cut about the same in depth. About 75 per cent of the material was moved by sluicing. The water washed the material into the fill and assisted in compacting the material. The contractor is now completing the moving of excavation by the use of two power shovels and a number of trucks.

of a contract for public work by a municipal corporation and the beginning of the work, further publication and letting of bids are not required; however, a distinction is made between the amendments or alterations in the plans and specifications which do not affect the material character of the work and those admitted changes or alterations which constitute substantial modifications or changes in the character and quality of the work to be performed.

"In this proceeding for a writ of mandate to compel the issuance of a warrant by a city auditor in payment for work done under a contract for the erection of a dam, where alterations in the specifications therefor were made upon the order of the State Engineer empowered so to do by an act regulating the construction of dams (Stats. 1929, p. 1505), which became effective after the letting of the contract, it must be assumed that the municipal corporation in adopting plans and specifications, and the contractor in entering into the contract, did so with the knowledge of the law applicable."

San Gabriel Dam
Experts Named
to Make Study
Reclamation
Flood Control

Review of October Activities In the Division of Water Resources

EDWARD HYATT, Chief of Division

Water Rights
Water Resources
Investigation
River Flow

SAN GABRIEL DAM

Construction of San Gabriel Dam by the Los Angeles County Flood Control District was stopped by the district during October, after receipt of an adverse report on foundation conditions by a board of engineers and geologists. This dam as planned would have been higher and more massive than any in existence, and would cost about \$25,000,000. It is reported that \$3,000,000 had been expended on it when work was stopped.

As the dam was under construction when the new law took effect, and as the district had not yet made application for its approval, it did not come within the jurisdiction of the state until a formal application was made by the County Flood Control District on October 26, accompanied by a filing fee of \$14,875.23. The application asks for the approval of the dam as originally planned. The Division of Water Resources will now take jurisdiction and make an investigation of the plans, specifications and foundations, which investigation will normally lead to either an approval, disapproval, or modification of the application.

SAN GABRIEL DAM BOARD

Immediately following the assumption of jurisdiction by the state, an investigation of the safety features of the plans, specifications and foundations of San Gabriel Dam was ordered. In view of the unprecedented size and height of the San Gabriel Dam, the difficult technical considerations pertaining to the design and foundations, and its importance to the valley below, the investigation to be made by the state will be comprehensive.

Under the law the State Engineer is empowered to employ consultants to report upon safety features, and in the case of San Gabriel Dam it has been decided to appoint a board consisting of three geologists and three engineers. This board consists of men of outstanding qualifications and wide experience in their respective fields, none of whom have heretofore been associated with the San Gabriel project. The personnel as announced by State Engineer Edward Hyatt is as follows:

Engineers: J. L. Savage, Chief Designing Engineer of the United States Reclamation Bureau. Dr. Elwood Mead, Commissioner of Reclamation, was asked to appoint the best qualified man from the unsurpassed Reclamation Bureau personnel and Dr. Mead has appointed Mr. Savage. Mr. Savage as Chief Designing Engineer of the Bureau, has for many years been in direct charge of the high masonry dams built by the Reclamation Bureau and is recognized as an authority on this subject.

George A. Elliott, Chief Engineer, Spring Valley Water Company, San Francisco: Mr. Elliott is one of the best known and best qualified engineers on dam construction on the Pacific coast. As chief engineer of the Spring Valley Water Company he has been in charge of all work on dams for that company, including the building, operation and maintenance of many large dams.

Mr. M. C. Hinderlider, State Engineer, Denver, Colorado: Mr. Hinderlider's record and reputation are impressive. As a consulting engineer many years in Denver, he directed the construction of dams both in the United States and Mexico. As State Engineer of Colorado he has been in charge of approximately 1000 dams in that state.

Geologists: Dr. Charles P. Berkey, Consulting Engineer, New York City, and Professor of Geology, Columbia University: Dr. Berkey's reputation is international as are those of several members of the board. He was a member of the General Sibert Board appointed by the Secretary of the Interior and the President of the United States to report upon the Boulder Canyon Dam, within the last year or two.

Dr. George D. Louderback, Consulting Geologist and Professor of Geology, University of California, Berkeley: Dr. Louderback has supervised construction of several high dams, from the geological standpoint, has reported upon many proposed sites, and was a member of the board appointed by Governor Young to report upon the St. Francis Dam.

Dr. Ira P. Williams, Consulting Geologist, Portland, Oregon, who has examined and reported on the foundations for many dams throughout the northwest, including the highest masonry dam in the west.

The state is fortunate in securing the services of experts of such eminence, ability and impartial judgment. It is expected that the board will convene in Los Angeles early in the week of November 11 and continue their work to completion, which will consist of a report to the State Engineer on the safety of the San Gabriel Dam as presented in the application of the Flood Control District.

San Gabriel Dam also comes under the jurisdiction of the United States Department of Agriculture. Under a reciprocal agreement between the state and the federal offices of the Department of Agriculture will be invited to cooperate in the investigation.

SAN JOAQUIN VALLEY WATER INVESTIGATION

The survey of the Mammoth Pool Reservoir site on the San Joaquin River has been continued with favorable progress. The area above Mammoth Pool Dam site has been covered. The two survey parties will move camp and continue their surveys downstream to the mouth of Big Creek.

On October 4 a party of ten men were put in the field working out of Dinuba for the purpose of locating an exchange canal from the Kings River south to the Kern River. Topography has been taken at the head of the canal to be used in making a layout of diversion works. The tentative elevation for the point of diversion of the canal has been taken as 445 feet. Up to date seven miles of this canal has been run out.

On October 23 another field party was put in the field to bring up to date the survey of the U. S. Engineers on the San Joaquin River from Mossdale Bridge to Mendota.

The crop survey of the San Joaquin Valley south of the San Joaquin River has been completed with the exception of the area in the consolidated district. This area is now being covered by Mr. F. L. Green, working in conjunction with Mr. C. H. Holley. This should be complete within a couple of weeks.

A crop survey has also been completed for the area north and west of the San Joaquin River and south of Patterson. A part of the crop survey has been transcribed to a wall map in the office.

Water supply studies to determine the yield of the unmeasured areas have been continued and the compilation and tabulation of ground water records have proceeded steadily.

During the month a field trip was made along the lower San Joaquin River from Mossdale Bridge to Mendota for the purpose of examining the proposed sites for pumping plants on the river channel which were selected during the earlier part of the investigation, also for the purpose of inspecting the principal diversions of canals now serving lands along the trough of the valley on both sides of the river and examining the state of development and quality of lands adjacent to the river.

SACRAMENTO VALLEY WATER INVESTIGATION

Geological investigations have been made on five dam sites on the Upper Feather River Drainage Basin and reports rendered thereon. These sites are important items in the state-wide development of water resources. Cost estimates of reservoirs at these sites are in progress.

Rapid progress has been made in the classification of lands and survey of crops in the Sacramento Valley. Up to date 900,000 acres have been surveyed in the field and in addition 400,000 acres have been reclassified in the office, based on information previously obtained in preparing the assessments for the Sacramento Valley Flood Control Project. All of this information has been transcribed onto an office map.

A survey has been made of the data available on ground water conditions in the Sacramento Valley and a tentative schedule prepared for collecting data on ground water levels this month. It is proposed to obtain information on about 200 wells distributed geographically throughout the valley. Where possible, wells measured by Kirk Bryan in 1913 will be utilized.

Data are being assembled in the office on water requirements for irrigable and irrigated lands in the Sacramento Valley and additional information is being obtained in the field.

Water supply studies of all the streams tributary to the Sacramento Valley have been continued throughout the month.

KINGS RIVER WATER INVESTIGATION

Water supply estimates have been completed in this investigation for six reservoir sites as proposed by the city of Los Angeles. These sites are as follows: Junction, Cedar Grove, Sentinel, Paradise, Tehipite, Simpson Meadows. Estimates of quantities in rock-fill dams at the several sites have also been completed for the height of dam proposed by the city of Los Angeles. Data are being collected for the purpose of estimating power developments at the various sites. Two conferences have been held with Mr. Randell of the Federal Power Commission.

SALINITY STUDIES

Work in connection with the salinity investigations has consisted principally of compilation and to some extent analyses of the data collected during the past several months.

The highway laboratory has been rendering excellent service in making dual analyses of about 200 samples a day. The field work in the future will be confined principally to making the standard tidal cycle surveys.

SALT WATER BARRIER

A tentative program and budget covering this investigation has been outlined and the work and report of Walker Young reviewed in a general way. The Walker Young Report on the Salt Water Barrier is now being printed, and will be available in about 50 days.

SNOW SURVEYS

Practically final arrangements have been completed in every watershed in the Sierra Nevada Mountains from Kern River on the south to Pit River on the north on the west side and for all the watersheds on the east side for snow gaging courses, extent of participation by the state and by various interested parties. Practically all organizations in the state which have an interest in a water supply from these watersheds have shown themselves to be very much interested in the proposed work and have agreed to make substantial contributions which will amount in some cases to as much as two-thirds of the cost of the field work and which will average for the entire area covered probably about one-half the cost of the field work. The state is furnishing equipment in each case so that everything will be done in a uniform way. This makes quite a heavy expense for the first year but the equipment is substantial and will last for many years. The program as laid out has been somewhat conservative as it was not desired to go too far in the first year. On the other hand it was deemed advisable to cover as much territory as possible.

WATER RIGHTS

During the month of October, 24 applications to appropriate water were received, 20 were rejected, 19 were approved, 7 permits were revoked and 8 licenses were issued.

Water master service was discontinued on all streams in the northern part of the state during the month of October.

NAPA COUNTY INVESTIGATION

The supervisors of Napa County appropriated \$2,000 which is to be matched by \$2,000 additional from the state to start an investigation of the water resources of Napa Valley in particular connection with the proposed diversion from Conn Creek. In resolutions the supervisors stated that it was their belief that the investigation should continue for three years.

SANTA MARIA INVESTIGATION

A meeting was held with the Chamber of Commerce of Santa Maria Valley in regard to an investigation of Santa Maria Valley. While a definite program was not outlined some work has already been started in connection with measuring the streams entering the valley.

IRRIGATION DISTRICTS

During October financial and economic investigations have been made of the Provident, Stinson, James and Terra Bella Irrigation districts. Visits have also been made to the Glenn-Colusa, Jacinto, Anderson-Cottonwood, El Camino, Princeton-Codora-Glenn, Merced, Turlock, Consolidated, Riverdale, Corcoran, Fresno and Tranquillity Irrigation districts. Conferences have been held in Sacramento with the officials of the El Dorado, Oroville-Wyandotte and Nevada Irrigation districts relating to their proposed construction and the economic development of these districts.

Recommendation has been made to the California Bond Certification Commission that the Commission approve requests of the following districts for expenditures in the amounts noted from their construction funds for additional new construction or betterment of their works: Oroville-Wyandotte Irrigation District, \$5,000; La Canada Irrigation District, \$4,339.54; West Stanislaus Irrigation District, \$80,967.03; total, \$90,306.57.

The California Bond Certification Commission has authorized the sale of bonds by the following districts at private sale: Oroville-Wyandotte Irrigation District, \$5,000; West Stanislaus Irrigation District, \$1,000.

DAMS

Activities of this subdivision have been directed first to prosecuting current work and second to development of personnel and methods to adequately handle the duties imposed by the new law governing the supervision of dams, which went into effect in August. Under this law not only must all new dams be supervised by the Division, but also all existing dams must be inspected and either approved or orders issued for their repair. A specialized staff will be necessary to handle this work. The personnel in this subdivision at the present time consists of the Deputy State Engineer, seven assistant engineers, and one field party. Ample office space has been made available on the fourth floor of the Public Works Building.

About 20 dams now under construction are being regularly inspected, the major ones being Salt Springs

(Pacific Gas and Electric Company, Amador County), Lyons (Pacific Gas and Electric Company, Tuolumne County), Juncal, Montecito County Water District, Santa Barbara County, Calaveras (City of Stockton, Calaveras County), Felt Lake (Stanford University, San Mateo County) and Chenery (California Water Service Corporation, Contra Costa County). Thirty-one applications have been received for approval of existing dams, five for new dams, and two for revisions and enlargements, and over \$25,000 in fees received during the current month. Twenty-six field inspections have been made.

The 1929 law governing supervision of dams has been declared by appellate court constitutional in all essential provisions.

RECLAMATION AND FLOOD CONTROL

Maintenance of Sacramento and San Joaquin Drainage District. A contract has been made with A. Mitchell of Sacramento to clear the timber growth from the Sacramento By-pass at a cost of \$875. This work is under way.

Small crews have been engaged on routine maintenance work on the project in Sutter County. Some of the trees growing along the east levee of the Sutter By-pass are being topped to promote a thicker and lower growth for levee protection. The irrigation of willows has been discontinued for the season.

A crew of about 25 men has been engaged in maintenance clearing work in the by-pass channels, and the pumping plants have been placed in condition for operation during the winter.

Floating river equipment has been moved up the Sacramento River to the Sacramento Slough, and is being used as a clearing camp to accommodate approximately 60 men. The crew at present consists of about 40 men, and part of their time will be put in on clearing maintenance in this vicinity. The camp was established primarily, however, for clearing construction under the flood control project.

Emergency Flood Control and Rectification of River Channels. All of the various matters of bank protection mentioned in the last report have progressed in various degrees. Arrangements have been completed for bank protection work in cooperation with Reclamation Districts No. 535 and No. 673 at an estimated cost of \$1,800. These districts have deposited their share of \$1,200.

Request has been made for additional bank protection work on the Mad River on the property of James B. Moore. The estimated cost of this work is \$400, of which the landowners have deposited \$200.

Surveys were made and plans were completed for the bank protection work on the Feather River in cooperation with Sutter County. A contract has been awarded to the Pacific Coast Construction Company for the construction of seven tree and steel retards on the right bank of the Feather River near Nicolaus at a cost of \$12,000. Arrangements have been made to secure the necessary trees for this work and construction will commence at once.

Surveys have been made at Robinson Bend on the Feather River to determine what work is necessary at this point. It was found that the proper procedure here would be to block off with a levee the large wash which has started within the last two years. The cost of this work will be approximately \$6,000, of which Butte County will contribute one-third, the landowners one-third, and the state one-third. Construc-

tion will commence as soon as the contributed funds have been deposited.

Surveys were completed for the proposed bank protection work at Isleton in cooperation with the Division of Highways, and plans are now being prepared in cooperation with the Maintenance Engineer. The estimated cost of the work is \$14,000, of which it is proposed this Division and the Division of Highways shall each pay one-half.

Surveys have been completed for bank protection work on Andrus Island, to be done in cooperation with Reclamation District No. 556.

A number of other bank protection jobs have been under consideration but they have not yet reached a definite shape. These are: Reclamation District No. 70, Reclamation District No. 730, Glenn County Levee District No. 3, and Yager Creek in Humboldt County.

Arrangements have been made to do a small piece of bank protection work at Randall Island in cooperation with Reclamation Districts No. 551 and No. 755. The total cost of this work will be \$525, of which the state will pay one-third. The contribution of the districts has already been received, and work will be commenced in the near future.

RUSSIAN RIVER JETTY

All pile driving work in the jetty structure has been completed as far as it will be carried this season; that is, the south jetty entirely across the bar and to the beach line. The railroad trestle has been completed and the track has been shifted to the high bar. The quarry is being opened up and a coyote hole is being driven for a heavy blast, which will break out about 16,000 tons of rock. It is expected that this can be shot within the next two weeks, after which the operations will consist almost entirely of loading and delivering rock to the jetty. It is fortunate that the track was in place on the high bar and on the trestle, for the reason that during the last week two or three heavy tidal waves broke entirely over the bar and the structure. No damage was done aside from covering a short stretch of the track with sand. The force now on this work consists of foreman and about twenty men.

PAJARO RIVER FLOOD CONTROL

The counties of Santa Cruz and Monterey have each deposited \$1,000 for work in the Pajaro River in accordance with the provisions of chapter 524, Statutes of 1929. The work to be done was examined last week and the procedure determined upon, which will be to clear the channel of all timber growth by hand. The amount available is \$4,000.

FLOOD MEASUREMENTS AND GAGES

A small crew has been organized and is now engaged in examining all the automatic and staff gages maintained by this office for measuring flood stages and flows, which will require approximately six weeks to have everything in working order for the season.

SACRAMENTO FLOOD CONTROL PROJECT

On September 27, the contracts between the Reclamation Board and the Department of Public Works were executed. They completed the arrangements for carrying on the work of flood control project clearing construction which is to be done by

this Department at the request of the Reclamation Board. The work is to consist of clearing in the by-passes at a cost of \$65,000, and clearing in the Feather River at a cost of \$27,558.

Immediately upon the execution of these contracts, an organized force of men engaged in maintenance clearing was transferred to construction clearing and the force was increased to a total of 45 men who have been engaged on the work continuously since that time. This was done on account of the lateness of the season, as it was imperative that work be commenced at once. At the same time, notices calling for bids were sent out covering the bulk of the clearing to be done in the by-pass. These bids were opened on October 14, but only two were received, which were rejected as they were thought to be high by at least 50 per cent.

It seems that there is an unusual condition existing among contractors interested in clearing work. The call for bids was well advertised and, in addition, notices were sent directly by mail to over 30 contractors who have engaged in this work in the past, but not more than eight contractors showed any interest. The two contractors who submitted bids operate large employment agencies in Sacramento.

In order to secure the necessary progress in this clearing work, our floating equipment has been moved to the lower end of the Sutter By-pass and have organized a floating camp which will be capable of accommodating 60 men; and we propose to engage this number of men on the clearing as long as the weather permits. The camp is ideal for this purpose, as it is movable and can be properly cared for when the water rises in the by-pass.

Contract has been awarded to P. D. Maritsas of Sacramento for the clearing of the piles in the channel of the American River. His bid was unusually low, \$1.80 per pile, and it is believed that the entire work can be done at a cost between \$4,000 and \$5,000. The contractor has already commenced work.

Bids have been called to be opened on October 28, for clearing a small area in the channel of the Feather River near Marysville, which is a part of the Feather River clearing construction.

I love the narrow winding road
That leads through farming lands;
I love it for the sparkling streams
That ripple o'er the sands.
But most of all I love it for
Its lack of hot dog stands.

USES AN AIRPLANE TO SURVEY DAM

Fresno—Opening an exhaustive survey of the state water situation and to select a dam site, a group of state engineers headed by Edward Hyatt, State Engineer in charge of water resources, recently completed an aerial tour by Western Air Express planes of the Kings and San Joaquin rivers.

The trip was a success, it was stated by Hyatt, who said that a satisfactory dam site was selected on the San Joaquin River, and that preparations are under way to have the ground survey crew begin work. Watersheds of both rivers were inspected and valuable data gained, the party said.

Those making the trip besides Mr. Hyatt were A. D. Edmonston and R. M. Vaughan of the State Engineer's staff; and E. W. Kramer and J. Nelson of the United States Forest Service, and R. R. Randall, Federal Power Commissioner.

MOTOR VEHICLE DIVISION REPORTS

FRANK G. SNOOK, Chief

NEW LICENSE PLATES

The Division is busily engaged in getting the 1930 supplies to all branch offices in preparation for the coming renewal. The majority of the branch offices have received their assignment of 1930 plates. When the "opening date," December 15th, rolls around, every item will be in readiness.

CALIFORNIA HIGHWAY PATROL

Orders have been issued to all members of the California Highway Patrol by Superintendent Eugene W. Biscailuz to arrest all motorists caught with operators' licenses issued prior to January 1, 1927.

The order conforms to a section of the new law canceling all licenses issued two years or more.

Motorists without a license issued since January 1, 1927, or who can not show evidence that they have applied for one will be charged with a misdemeanor.

Biscailuz said he did not believe any large number of motorists would be affected by the order. The Division believes that at least 85 per cent of all the operators in the state have secured new licenses or have made application for them.

REGISTRATIONS

During the period from January 1 to September 30, 1929, a total sum of \$9,746,193.43 was collected. The total number of dealers, transfers and registrations recorded for this period is as follows:

Automobiles	1,825,986
Trucks, solid tires	20,336
Trucks, pneumatic tires	63,803
Motorcycles	9,099
Trailers, solid tires	10,273
Trailers, pneumatic tires	30,238
Auto dealers	3,248
Motorcycle dealers	70
Trailer dealers	40
Transfers	502,697
Total	2,465,790

Since January 1st, 98,524 nonresident cars have been checked through border checking stations, and 59,986 nonresident permits have been issued as of September 30th.

INSPECTOR OF TRAFFIC

Announcement has been made of the appointment of Captain Otto Langer as inspector in charge of the Bureau of Traffic of the Division of Motor

Vehicles. Captain Langer has been in charge of the traffic squad of San Diego County. His headquarters will be in Sacramento.

OPERATORS' LICENSES

From July 11 to October 23, 1929, the Division, with the able assistance of many police departments throughout the state, has issued 1,414,307 operator's licenses. As of October 23, there were approximately 2,480,000 licensed operators, and between 135,000 and 140,000 licensed chauffeurs.

OCTOBER REPORT OF DIVISION OF ARCHITECTURE

GEORGE B. MACDOUGALL, Chief

BUILDING PROGRAM

In connection with the 1929 appropriations the Division of Architecture has accomplished in the office up to October 1, 1929, the necessary office work for a total construction valuation of \$2,347,963. This exceeds the amount estimated in report dated May 27, 1929, by \$97,963.

Total value of work for which contracts were awarded during October	\$205,423
Projects on which bids are in but awards not yet made	121,383
Projects now out for bids	645,900

Grand total

\$972,706

Institutions included in October program:

Mendocino State Hospital: 3 contracts awarded, \$122,549; 3 contracts pending, \$117,490.

San Francisco State Teachers College: 1 contract awarded, \$15,897.

Pacific Colony: 1 contract awarded, \$8,920.

Sonoma State Home: 3 contracts awarded, \$45,530.

Veterans Home: 1 contract awarded, \$11,527.

Fort Ross, Sonoma County: Award pending for restoration of stockade, \$1,498.

Tahoe Public Camp Ground: Award pending for gate lodge, \$2,395.

Bids to be opened:

State Nursery: Bids for painting to be opened, November 1st.

San Diego State Teachers College: Bids for library and science building to be opened, November 5th.

Public Works Building: Bids upon addition to be opened, November 12th.

Veterans Home: Bids for barracks building to be opened, November 19th.

WASHINGTON—The farm-to-market road bill, recently passed, increases the gas tax from 2 cents to 3 cents. The additional cent will provide an estimated \$2,197,000 the first two years, to be distributed among the 39 counties as follows: one-half equally proportioned, one-quarter in ratio of vehicle registration, and one-quarter in ratio of number of farm.

State Highway Progress Reports

ALAMEDA COUNTY

The reconstruction of the 8.8 miles of highway between Hayward and Niles, widening 11 feet with Portland cement concrete and surfacing the existing 18 feet with asphalt concrete, Hanrahan Co., contractors, is progressing, all the heavier grading on line and grade changes being complete and pouring of concrete in progress.

CONTRA COSTA COUNTY

The acceptance of the Prentiss Paving Company's contract through Pinole and Hercules, opens up the Martinez Highway from Oakland to the Carquinez Bridge. This completed section, together with the widened highway in use, gives a minimum width of 30 feet of surfaced highway to the Carquinez Bridge. The widened roadway is a joy to the motorist though the Sunday crowd utilizes it to capacity.

FRESNO COUNTY

Mr. William Wilcox was awarded the contract for wrecking and disposing of the old highway bridge over the San Joaquin River at Herndon.

The convict camp in the Kings River Canyon under Superintendent D. M. Lee is making good headway on the first section of work opened up. Provisions for winter camp and work are complete.

Tieslau Bros. will soon complete their contract for pre-mixed oil surface from Coalinga to Parkfield Junction on the Sierra-to-the-Sea Lateral. E. N. Hveem is resident engineer for the state.

IMPERIAL COUNTY

Construction work is most favorably handled in the winter in the Imperial Valley and as this season is approaching plans for a number of Imperial Valley projects are nearing completion.

Bids will soon be asked for paving from Brawley to 4 miles west of Westmoreland; paving from Myers Creek to 3 miles west of Coyote Wells, widening and resurfacing from Dixieland to Seeley; paving from El Centro to Holtville; and constructing an under-grade crossing under the San Diego and Arizona Railroad 3 miles west of Coyote Wells.

KERN COUNTY

Bids are being asked for on the construction of 2 miles of realignment on the Cholame Lateral west of Lost Hills.

The Los Angeles Decomposed Granite Company was low bidder on the construction of a pre-mixed oil

surface from Pentland to San Emigdio Road on Route 57.

Five miles of non-skid surface was placed by day labor forces on slippery portions of the Valley Route south of Bakersfield. This is expected to considerably lessen the number of accidents on this tangent during the winter.

Force-Curragan and McLeod are rapidly completing their contract for grading and surfacing on Route 57 from Bakersfield to the mouth of the Kern River Canyon. E. E. Evers is in charge for the state.

KINGS COUNTY

Day labor forces under Jack Milford are grading and widening the roadway from Hanford to Goshen on Route 10. Additional shoulder work from Hanford to Lemoore will soon be put under way.

LASSEN COUNTY

The contract from Susanville to Milford, Hein Bros. and Chittenden, contractors, is now being double shifted and is moving along quite rapidly. No difficulties are anticipated in the progress until wet weather sets in, at which time it will be difficult for the contractor to screen the wet materials, and it may be necessary to shut down during the winter.

It is now anticipated that the work on the contract from Doyle to Long Valley Creek, Myer Rosenburg, contractor, will be completed early in November and will be open for traffic as soon as the bridges which are also under construction on this contract, are completed.

LOS ANGELES COUNTY

The contract for a line change immediately north of the Newhall Tunnel has been awarded to McCray Co. Construction is started on this work.

Work on paving crescent-shaped areas on the Ridge Route with bituminous macadam has been nearly completed by Gibbons & Reed, contractors. These areas were left unpaved when alignment on this route was straightened by the state day labor forces. Emulsified asphalt is being used in this work.

Rapid progress is being made in the work of grading Newhall Alternate Line between Tunnel Station and the Santa Clara River. Le Tourneau and Lindberg are the contractors. It consists of grading a 46-foot roadbed, 8.6 miles long, and eliminates from this route the Newhall Tunnel and several dangerous curves in the vicinity of Newhall and Saugus. It is expected this work will be completed about December 1st.

A contract on the Foothill Boulevard, between Glendora and Claremont, for constructing 5.5 miles of asphaltic concrete pavement, 30 feet by 6 inches has been completed by Griffith Company, contractors.

The first contract on the La Canada-Mt. Wilson Highway for grading 2.6 miles of 40-foot roadbed was

awarded to H. W. Rohl Company on August 14th. Grading work is in progress.

MADERA COUNTY

A. Teichert & Son have been awarded the contract for widening and resurfacing with asphalt concrete from Califa to the county line on the main Valley Highway. Grading operations are well under way.

The contract for a subway at Califa at the junction of the Pacheco Pass Highway with the Golden State Highway has been awarded to Otto Parlier of Tulare.

The Valley Paving Company are grading on their contract from Berenda to Califa on Route 4. Mr. W. T. Rhodes is resident engineer on this work.

MARIN COUNTY

Hanrahan Company of San Francisco were awarded a contract to construct 11.9 miles of highway from 1 mile south of Petaluma to Ignacio, the beginning of the job they finished last year. This section is to be improved by the construction of a 20-foot second-story concrete pavement and bituminous macadam pavement with extensive line changes, particularly the one from Novato to Ignacio, utilizing the concrete bridge under construction at Novato Creek.

A good start has been made; considerable grading and drainage structures completed and concrete pavement should start in a few weeks. This job comes between tourist seasons and it is hoped to have enough of it completed in time to carry the 1930 summer traffic.

The 1.6-mile section between Gallinas Creek and San Rafael, the gap necessary to complete the reconstruction and widening from Petaluma to San Rafael was awarded to Granfield Farrar & Carlin of San Francisco. This is the fourth contract obtained by this company in the immediate vicinity of San Rafael in the last year. Work has just started, but as the most of the work is on an extensive line change, little interference with traffic will result. The value of this line change is very striking as it eliminates a number of sharp curves, including the circuitous section just north of the city limits of San Rafael and avoids protective work over the N. W. P. R. R. Company's tunnel portal. The new alignment furnishes splendid alignment and grades and includes an overhead crossing of the N. W. P. R. R. tracks at Forbes Station which obviates all grade crossings.

This overhead structure is planned to be advertised for bids soon to be completed with the road approaches.

Bids are to be advertised for early in the winter season for the surfacing of the section of new road now being graded between San Rafael and Alto. This, with a number of structures to be constructed are all to be completed for summer traffic in 1930.

MARIPOSA COUNTY

Oil mixing work on the Yosemite All-year Highway has been completed from the Mariposa County line to the Yosemite National Park. This road is now in good condition for the winter travel.

MENDOCINO COUNTY

The construction of three timber bridges and approaches thereto with line changes, on the road from McDonald to the Sea, are nearing completion. While the winter weather will prevent any immediate material benefit, this work will be appreciated when the summer season opens.

MERCED COUNTY

Day labor forces are removing the narrow bridge at the north city limits of Merced and widening the pavement to 30 feet. This will connect with the street widening which the city of Merced is doing and materially improve the entrance to the city.

Oil-mixed rock borders 4 feet in width have been placed on Route 18 from Merced to the county line, making this section safe for traffic in all weather.

NAPA COUNTY

Smith Bros. of Eureka have completed their contract for 5.3 miles of oil-treated shoulders from Napa to Greenwood Corner. The adjacent section, Napa Wye to the Solano County line, Fredrickson & Watson, contractors, to be regraded and surfaced, is nearing completion. These jobs, connecting with the Fredrickson & Watson contract to the east as recently completed, will furnish much improved connection from Napa Valley and Vallejo to Cordelia and the Sacramento Valley.

ORANGE COUNTY

The contract for a line change 0.7 of a mile in length between Serra and San Juan Capistrano was awarded to Matich Bros. on August 12th. This work consists of a 40-foot graded roadbed with Portland cement concrete pavement, 20 feet by 7 inches. Grading is completed on about one-quarter of a mile and is in progress on the rest of the contract.

A contract for a line change to connect up the overhead crossing of the A. T. & S. F. Railway at Irvine is rapidly nearing completion. This consists of grading 0.7 of a mile and paving with Portland cement concrete, 30 feet wide. Steele Finley is the contractor.

A contract for paving one-half width between Santa Ana and Anaheim was awarded on June 11th to Griffith Company. This section is 4.9 miles long. The paving work is being done in cooperation with Orange County, the state paying for a strip of pavement 28 feet by 7 inches and the county paying for a like amount. Grading is completed on this contract and about 2 miles of pavement have been completed.

PLUMAS COUNTY

Work is complete on the contract from the Tehama County line to 6½ miles east, Charles Harlowe, Jr., contractor. This section will be put in use by the public as soon as the project immediately west of it

is completed by the Bureau of Public Roads. This will be accomplished about the first of November.

RIVERSIDE COUNTY

The work of constructing the abutments and superstructure of the Wineville grade separation on the Riverside-Pomona Highway is well under way. The work is being done in cooperation with the Division of Highways by the Union Pacific Railroad Company. On completion of the railroad company's contract, the Division of Highways will let a contract for paving the highway under the structure.

Of interest to Riverside County are two bridges being constructed on the Riverside-Pomona Highway. One of these bridges will span the San Antonio Wash at the east city limits of Pomona and the other will cross a storm drain channel at Collins.

That portion of the Riverside-Phoenix route via Mecca and Blythe known as the "Box Canyon" has been damaged by floods three times during the past summer. The Maintenance Department has established a camp at Shavers Well for the purpose of repairing the damage. Grader crews are at work and surfacing material is being supplied where needed. The road is open and in good condition.

SAN BERNARDINO COUNTY

Steel Finley has almost completed his contract from Claremont to Cherry Avenue on the Foothill Boulevard, between Los Angeles and San Bernardino. The pavement widening and resurfacing is complete and open to public traffic. The original 18-foot Portland cement concrete pavement has been widened to 30 feet and resurfaced with asphalt concrete. Simultaneously with this project the Pacific Electric undergrade crossing one-half mile east of Upland has been widened.

George Herz & Company have completed their contract for constructing 20-foot Portland cement concrete pavement on the San Bernardino-El Centro route from San Bernardino to Santa Ana River, a distance of about 2 miles. Special attention has been given to making a good connection with the streets radiating from the intersection in front of the National Orange Show Building.

The Dillon and Boles contract for grading and oil-treated surfacing on the Arrowhead Trails Highway between Yermo and Dunn is nearing completion.

The George Herz & Company contract for similar improvement on the above route from Barstow to Yermo is now well under way.

Two new contracts have been awarded to the New Mexico Construction Company for grading and oil-treated surfacing on the National Old Trails Highway extending from 2 miles west of Argos to 6 miles east of Amboy. Work will soon be started.

The Allied Contractors' project for similar improvement on the above route from 4 miles west of Hector to 2 miles west of Argos is about 70 per cent complete.

SAN DIEGO COUNTY

Work has just been started by the R. E. Hazard Contracting Co. of San Diego on constructing oil rock

borders on portions of the Coast Route between the city limits of San Diego and Oceanside.

A contract for grading the Rose Canyon Road between Balboa avenue and Torrey Pines road was awarded on August 13th to the R. E. Hazard Contracting Company. This section is 5.4 miles long and is to be a 46-foot graded roadbed. About one-half mile has been graded to date.

The contract for grading a roadbed 36 feet wide and placing of Portland cement concrete pavement 20 feet by 7 inches is in progress between Pine Valley and Kitchen Creek on the San Diego-El Centro Highway. It is expected that this section will be completed by the end of the year.

A contract for 4.5 miles of 38-foot graded roadbed between La Posta Creek and Miller Creek on the San Diego-El Centro Highway was awarded on May 27th to the Nevada Contracting Company. Grading is completed for a distance of about 2 miles.

A contract for grading 3.9 miles of 36-foot roadbed from Kitchen Creek to La Posta and paving with 20 feet by 7 inches Portland cement concrete was awarded on June 25th to Basich Bros. About 1 mile of rough grading is completed, and grading is now in progress on about 2 miles. This section is on the San Diego-El Centro Highway.

SAN MATEO COUNTY

The Bayshore Highway, San Francisco to South San Francisco, is complete, except a section of about one-quarter-mile through the deep cut at Sierra Point, where slides have developed. Much of this slide material has been removed but in order to complete the work and to care for the probable additional slides during wet weather, the contractor has retained a small amount of equipment on the job.

Bids are to be advertised for this fall to grade and surface the 7.3 miles section of the Bayshore Highway from 5th Ave., San Mateo to Redwood City. This work, consisting mostly of embankment 60 feet wide, is interesting in that there are three distinct types of material, hydraulic fill, dragline fill and imported borrow to be used in varying arrangements and a total yardage of about 600,000.

SAN MATEO, SANTA CLARA AND SANTA CRUZ COUNTIES

The Skyline Boulevard.—Twohy Bros. Co. and J. F. Shea Co., grading and surfacing contractors, on the 13.8 miles between La Honda Road and Saratoga Gap, having completed their contract, the state forces placed an armor coat oil surface and the road was opened on September 28th. Each succeeding section of this boulevard only further stamps it as one of the finest scenic roads of the state. The rapid change of vista, now the broad Pacific, then the beautiful San Francisco Bay and Santa Clara Valley, with frequent glimpses of wild redwood gulches, or of the sparkling Spring Valley lakes, furnish material for a delightful pleasure trip, spiced as it is with swinging curves and steep slopes, gigantic redwood trees, fragrant pines, colorful madrones and manzanita, with redberries and forest flowers.

SANTA CLARA COUNTY

The section of the Peninsula Highway, Sunnyvale to Santa Clara, N. M. Ball, contractor, is completed

except cleanup. It is the first piece of the contemplated widening of this highway from Palo Alto to Santa Clara in three sections. The second section from Palo Alto southerly, 4.36 miles, is to be advertised soon. The third and connecting section is to come up early next year.

The newly completed section, with its diagonal realignment eliminating two right-angle turns, is a fine piece of road, the whole section being a striking example of modern highway standards as applied to valley roads.

SHASTA AND TRINITY COUNTIES

A crushing plant set up on the Shasta County end of the contract on the Trinity Lateral awarded to A. Milne, has completed its run and has been closed down. The other crushing plant, located in Grass Valley Creek in Trinity County, is producing rock in a very satisfactory manner and the contract is progressing rapidly.

SISKIYOU COUNTY

The first 10-foot strip of pavement throughout the whole length of the job on the Shasta River to Gazelle contract, T. M. Morgan Paving Company, was completed on October 18 and the contractor has now returned to the southerly end of the job to begin laying the second strip. It is estimated that the paving work will be completed about the first of December and that we will be able to turn the new pavement over to the traffic about Christmas time.

Paving work on the contract at Spring Hill, Mathews Construction Company, contractors, will be started on this contract on October 23 and it is estimated will be completed before the end of November.

TEHAMA COUNTY

A contract has just been awarded to A. F. Giddings of Sacramento for gravel surfacing and screenings for stockpiles on the Red Bluff-Susanville Lateral from Paynes Creek to Morgan Springs. The contractor is assembling his machinery and getting it ready to ship to the work. Nothing has been done on the ground as yet. This reinforcing and stockpiling of screenings is preparatory to placing an armor coat for our next season.

TULARE COUNTY

The Valley Paving Company is well along with the grading and culvert work and have started laying headers on their contract on the Golden State Highway between Pixley and Delano. The completed job will be a 20-foot asphaltic concrete resurface. H. B. La Forge is resident engineer on this contract.

Members of the state highway patrol force found more than a thousand violations of the traffic laws in less than a month. Is it any wonder that cars fall off cliffs, run into trees, get into fights with locomotives, and otherwise misbehave?—*Baudette Region.*

Record of Bids and Awards

HIGHWAY BID OPENINGS FROM SEPTEMBER 25 TO OCTOBER 21

CALAVERAS COUNTY—Between 2 and 4 miles south of Mokelumne Hill, 2.2 miles to be surfaced with screened gravel. Dist. X, Rt. 65, Sec. A. M. J. Bevanda, Stockton, \$9,954; A. V. Alder, Sacramento, \$8,485; Robt. Heaney, Hayward, \$6,628. Contract awarded to Adams Co., Angels Camp, \$5,028.

COLUSA COUNTY—For widening existing road-bed to 26 feet, about 6.9 miles. Dist. III, Rt. 15, Sec. B. Contract awarded to C. R. Merrill, Williams, \$11,251.68.

DEL NORTE COUNTY—Between Elk Valley and $1\frac{1}{2}$ miles south of Smith River, portions to be drained. Dist. I, Rt. 1, Sec. C. L. C. Seidel, Oakland, \$16,346.24.

EL DORADO COUNTY—3.8 miles to be surfaced with untreated crushed gravel or stone. Dist. III, Rt. 65, Sec. C. Tieslau Bros., Berkeley, \$14,000; Montfort & Armstrong, Sacramento, \$18,000; W. S. Biggs, El Dorado, \$14,740. Contract awarded to Hemstreet & Bell, Marysville, \$11,750.

FRESNO-MADERA COUNTIES—Removal and disposal of old Herndon Bridge. Dist. VI, Rt. 4, Secs. C and A. Contract awarded to Wm. Wilcox, Selma, \$1,800.

HUMBOLDT COUNTY—Between Fish Creek and Stephens Grove, 2.9 miles to be graded and surfaced with untreated crushed gravel or stone. Dist. I, Rt. 1, Sec. B. J. M. De Luce, Oakland, \$147,956; Jasper-Stacy Co., San Francisco, \$229,412; Kennedy-Bayless Const. Co., Oakland, \$178,646; J. E. Johnston, Stockton, \$168,832; J. F. Knapp, Oakland, \$154,009; S. H. Palmer Co., San Francisco, \$190,022; Ariss-Knapp Co., Oakland, \$187,195; Wren & Greenough, Portland, Oregon, \$139,940; Mercer-Fraser Co., Eureka, \$177,362; Guy F. Atkinson Co., San Francisco, \$179,585; D. McDonald, Sacramento, \$178,091; W. H. Hauser, Oakland, \$143,010; C. R. Johnson, Portland, Oregon, \$177,894. Contract awarded to E. C. Coats, Sacramento, \$130,767.60.

INYO COUNTY—Between Little Lake and Coso Junction, 3.7 miles to be graded and surfaced with oil-treated gravel or stone. Dist. IX, Rt. 23, Sec. G. A. J. Grier, Oakland, \$70,214. Contract awarded to Fred W. Nighbert, Bakersfield, \$63,297.69.

LOS ANGELES COUNTY—Between Newhall Tunnel and Newhall, 1.1 miles to be graded and paved with Portland cement concrete. Dist. VII, Rt. 4, Sec. E. H. E. Cox and Son and G. W. Kuhn Co., Los Angeles, \$76,523; George Mitchell Co., Huntington Park, \$98,179; Gibbons and Reed Co., Burbank, \$94,541; McWilliams and Ritchey, Los Angeles, \$98,437; Match Bros., Elsinore, \$77,511; McCray Co., Los Angeles, \$69,087; C. G. Willis & Sons, Los Angeles, \$72,698; O. A. Lindberg, Newhall, \$93,588. Contract awarded to McCray Co.

MADERA COUNTY—Across Cottonwood Creek, about 3 miles south of Madera, a reinforced concrete girder bridge. Dist. VI, Rt. 4, Sec. A. Oakland Harbor Const. Co., Oakland, \$29,697; Otto Parlier, Tulare, \$32,104; George J. Ulrich Const. Co., Modesto, \$32,737; R. B. McKenzie, Red Bluff, \$33,155; E. B. Skeels, Roseville, \$32,669; M. B.

McGowan, \$32,412; Carl H. Peterson, San Francisco, \$30,543; Liner & Allen, Merced, \$31,994. Contract awarded to Geo. G. Wood, Fresno, \$28,962.50.

MONTEREY COUNTY—At San Ardo, 1.5 miles to be graded and paved with Portland cement concrete. Dist. V, Rt. 2, Secs. H and G. C. W. Wimmer & J. F. Shephardson, Bakersfield, \$112,400; Cornwall Const. Co., Santa Barbara, \$113,184; Peninsula Paving Co., San Francisco, \$96,620; J. F. Knapp, Oakland, \$98,278; Meyer Rosenberg, San Francisco, \$113,781; Ariss-Knapp Co., Oakland, \$131,802; McCray Co., Los Angeles, \$106,548; W. A. Dantonville, Salinas, \$97,444.75; Isbell Const. Co., Fresno, \$110,089; Granite Const. Co., Watsonville, \$104,750; M. J. Bevanda, Stockton, \$98,316; Prentiss Paving Co., San Jose, \$95,947; C. T. Malcom, Walnut Creek. Contract awarded to Fredrickson & Watson Const. Co., Oakland, \$95,450.30.

MONTEREY COUNTY—23 miles north of San Simeon, constructing a timber bridge across Villa Creek. Dist. V, Rt. 56, Sec. A. C. C. Gildersleeve, Felton, \$13,899; E. D. Jarvis and Will Porter, San Luis Obispo, \$20,810; Theo. M. Maino, San Luis Obispo, \$14,939. Contract awarded to H. C. Whitty, Sanger, \$11,644.

PLACER COUNTY—Bridge across Coon Creek overflow. Dist. III, Rt. 3, Sec. B. Matt J. Bevanda, Stockton, \$9,636; R. B. McKenzie, Red Bluff, \$8,747; Peter F. Bender, North Sacramento, \$9,820. Contract awarded to C. C. Gildersleeve, Napa, \$8,738.50.

SAN BERNARDINO COUNTY—Between 1.5 miles west of Siberia and 6 miles east of Amboy, 22.4 miles to be graded and surfaced with oil-treated crushed gravel or stone. Dist. VIII, Rt. 58, Sec. J and K. P. J. Aknadzich, Los Angeles, \$535,826; V. R. Denis Const. Co., San Diego, \$411,224; Dillon and Boles, Los Angeles, \$419,135; Hodgman and MacVicar, Pasadena, \$387,749; George Herz & Co., San Bernardino, \$418,955; Allied Contractors Inc., Omaha, Nebraska, \$396,107; Isbell Construction Co., Fresno, \$460,504; S. J. Hales, Santa Ana, \$399,747; Lord and Bishop, Oroville, \$436,762; C. R. Adams, Nevada City, \$439,090; Fredrickson & Watson Const. Co., Oakland, \$439,203. Contract awarded to New Mexico Const. Co., Inc., Denver, Colorado, \$384,533.40.

SAN JOAQUIN COUNTY—Near French Camp, 2 timber trestles. Dist. X, Rt. 5, Sec. B. Fredrickson & Watson Construction Co., \$24,509; Lord and Bishop, Oroville, \$24,136; C. W. Wood, Stockton, \$24,205; Griffith-Hunter, Inc., Sacramento, \$23,977; R. B. McKenzie, Red Bluff, \$24,970; Carl Nelson, Stockton, \$24,970. Contract awarded to M. B. McGowan, \$23,543.50.

SONOMA AND MARIN COUNTIES—A reinforced concrete bridge across San Antonio Creek, 6 miles south of Petaluma. Dist. IV, Rt. 1, Secs. C and A. C. C. Gildersleeve, \$23,015; M. B. McGowan, San Francisco, \$22,599; A. T. Howe, Santa Rosa, \$25,709; Rocca & Coletti, San Rafael, \$23,556. Contract awarded to McDonald & Maggiora, Sausalito, \$20,035.

TEHAMA COUNTY—Between Butte County line and Red Bluff, furnishing and hauling and placing untreated crushed gravel surfacing. Dist. II, Rt. 3, Secs. A and D. Bechtel-Kaiser Rock Co., Oakland, \$11,645; James E. Johnson, Stockton, \$13,287. Contract awarded to Hemstreet and Bell, Marysville, \$11,137.80.

TUOLUMNE COUNTY—Between 1 mile northwest of Shaws Flat and the Columbia-Sonora Road, 1.6 miles to be surfaced with screened gravel. Dist. X, Rt. 65, Sec. A. Contract awarded to The Adams Co., Angels Camp, \$5,984.

ACCEPTANCES OF CONTRACTS

Contract of Maurer & Sons of Eureka for constructing a reinforced concrete bridge across Salmon Creek in Humboldt County on the Redwood Highway. Approximate cost \$10,900.

Contract of Webber Construction Company of Crescent City for constructing reinforced concrete bridge across Hardscrabble Creek near Adams Station in Del Norte County on the Redwood Highway. Approximate cost \$19,100.

Contract of J. E. Johnston of Stockton for constructing a graded roadbed and placing crushed rock surfacing thereon from the southerly boundary of Del Norte County to Richardson Creek. Approximate cost \$299,800.

Contract of A. Teichert & Son of Sacramento for constructing a bituminous macadam pavement between Fairville and Vineburg Junction, Sonoma County, 7.4 miles on the Ignacio-Napa-Cordelia road. Approximate cost \$86,000.

Contract of Hemstreet & Bell of Marysville for surfacing and oiling from Butte City to the Chico Road, Glenn County, on the Oroville-Willows lateral. Approximate cost \$6,000.

Contract of J. F. Collins of Stockton for construction of gravel shoulders from Bradley Crossing on to the road from Merced to Sequoia. Approximate cost \$7,600.

Contract of Bartlett & Mathews of Pasadena for constructing a graded roadbed with oil-treated crushed stone surface from Mojave to a point 7 miles south of Cinco on the Mojave-Owens Valley Highway in Kern County. Approximate cost \$98,900.

Contract of A. G. Raisch of San Francisco for constructing an asphalt concrete pavement through the San Anselmo in Marin County for about 0.6 of a mile. Approximate cost \$10,700.

Contract of D. McDonald of Sacramento for constructing a double box culvert across Meeks Creek in El Dorado County on the Placerville-Tahoe Road. Approximate cost \$10,750.

Contract of J. P. Holland, Inc., of San Francisco for constructing a graded roadbed between Drytown and Amador City on the Mother Lode Highway for about 2.8 miles in Amador County. Approximate cost \$102,000.

Contract of A. Teichert & Son, Inc., of Sacramento for constructing a graded bed and placing a bituminous macadam surface between Estrella River and the Sacramento Ranch in San Luis Obispo County on the Cholame lateral. Approximate cost \$79,100.

Contract of E. M. and Edgar Noble of Marysville for constructing a graded roadbed between a point 1 mile northwest of Shaws Flat and the Sonora-Columbia road in Tuolumne County on the Mother Lode Highway. Approximate cost \$22,600.

Contract of Lord & Bishop of Oroville for constructing a timber bridge across the Little Sur River between Carmel and Cambria in Monterey County. Approximate cost \$27,500.

Contract of Webber Construction Co. of Crescent City for placing untreated crushed rock surfacing between Richardson Creek and Klamath River in Del Norte County for about 2.2 miles. Approximate cost \$10,500.

Contract of Smith Brothers of Eureka for construction of oil-treated rock borders between Napa and Greenwood corner in Napa County for about 5.2 miles. Approximate cost \$15,300.

WATER PERMITS AND APPLICATIONS

Permits to Appropriate Water, Issued by the Department of Public Works, Division of Water Rights, During the Month of October, 1929.

CALAVERAS COUNTY—Permit 3351, Application 5982. Issued to Comanche Gold Dredging Co., Los Angeles, Oct. 16, 1929, for 2 c.f.s. from Mokelumne in Sec. 12, T. 4 N., R. 9 E., M. D. M., for mining purposes. Estimated cost \$7,500.

EL DORADO COUNTY—Permit 3338, Application 6335. Issued to U. S. Eldorado National Forest, Placerville, Sept. 30, 1929, for 5000 gallons per day from Eagle Falls Creek in Sec. 28, T. 13 N., R. 17 E., M. D. M., for domestic purposes. Estimated cost \$250. (Note. Permit 3338 issued Sept. 30, 1929, was omitted from Sept. publicity list.)

EL DORADO COUNTY—Permit 3341, Application 6105. Issued to Horace M. Scales, San Francisco, Oct. 11, 1929, for 500 gallons per day from unnamed stream in Sec. 21, T. 11 N., R. 16 E., M. D. M., for domestic purposes.

EL DORADO COUNTY—Permit 3346, Application 6356. Issued to Henry A. Arvidson, et al., Placerville, Oct. 14, 1929, for 0.12 c.f.s. from unnamed spring in Sec. 12, T. 13 N., R. 10 E., M. D. M., for mining purposes. Estimated cost \$1,500.

EL DORADO COUNTY—Permit 3343, Application 6304. Issued to Cathedral Water Association, Fallen Leaf, Oct. 11, 1929, for 0.025 c.f.s. from Cathedral Springs in Sec. 15, T. 12 N., R. 17 E., M. D. M., for domestic purposes. Estimated cost \$1,000.

HUMBOLDT COUNTY—Permit 3348, Application 6392. Issued to P. M. Schmoock, Scotia, Oct. 14, 1929, for 0.0167 cubic foot per second from Eel River in Sec. 31, T. 2 N., R. 1 E., H. M. for irrigation of 1.51 acres. Estimated cost \$400.

IMPERIAL COUNTY—Permit 3340, Application 6307. Issued to John Diehl, Palo Verde, Oct. 1, 1929, for 0.19 c.f.s. from unnamed lake in Sec. 22, T. 9 S., R. 21 E., S. B. M., for irrigation of 15 acres. Estimated cost \$700.

LOS ANGELES COUNTY—Permit 3342, Application 6195. Issued to Lulu S. Diven, Los Angeles, Oct. 11, 1929, for 0.075 c.f.s. from a spring in Sec. 31, T. 4 N., R. 11 W., S. B. M., for domestic and irrigation of 4 acres. Estimated cost \$500.

MONO COUNTY—Permit 3347, Application 6276. Issued to Gordon McBride, Bishop, Oct. 14, 1929, for 0.0003 c.f.s. from Rock Creek in Sec. 33, T. 4 S., R. 30 E., M. D. M., for domestic use. Estimated cost \$75.

PLACER COUNTY—Permit 3349, Application 6332. Issued to Pacific Gas & Electric Company, San Francisco, Oct. 15, 1929, for 120 c.f.s. augmented flow of Bear River in Sec. 22, T. 15 N., R. 9 E., M. D. M., for power purposes. Estimated cost \$762,000.

RIVERSIDE COUNTY—Permit 3354, Application 6317. Issued to county of Riverside, Riverside, Oct. 29, 1929, for 0.02 c.f.s. from Bicknell Spring in Sec. 18, T. 6 S., R. 3 E., S. B. M., for domestic purposes. Estimated cost \$2,000.

SAN BERNARDINO COUNTY—Permit 3344, Application 6108. Issued to Department of Public Works, Division of Highways, San Bernardino, Oct. 11, 1929, for 0.15 c.f.s. from unnamed spring in Sec. 30, T. 2 N., R. 3 W., S. B. M., for proposed public recreational grounds. Estimated cost \$1,300.

SAN BERNARDINO COUNTY—Permit 3350, Application 6164. Issued to Mrs. Dorothy M. Witwer, Devore, Oct. 15, 1929, for 0.1 c.f.s. from unnamed spring in Sec. 32, T. 2 N., R. 5 W., S. B. M., for irrigation and domestic purposes on 10 acres. Estimated cost \$100.

SAN DIEGO COUNTY—Permit 3339, Application 6217. Issued to Norman E. Veazey, Aguanga, Oct. 1, 1929, for 0.025 c.f.s. from Layton Canyon in Sec. 24, T. 9 S., R. 2 E., S. B. M., for irrigation and domestic use on one acre. Estimated cost \$100.

SAN DIEGO COUNTY—Permit 3345, Application 6251. Issued to Division of Highways, Sacramento, Oct. 11, 1929, for 0.12 c.f.s. from Descanso Mountain Spring in Sec. 26, T. 15 S., R. 3 E., S. B. M., for the traveling public. Estimated cost \$100.

SISKIYOU COUNTY—Permit 3355, Application 6367. Issued to Great Northern Quicksilver Mines, Inc., San Francisco, Oct. 30, 1929, for 0.25 c.f.s. from East Fork of Empire Creek in Sec. 18, T. 47 N., R. 7 W., M. D. M., for mining purposes. Estimated cost \$8,000.

TRINITY COUNTY—Permit 3352, Application 6361. Issued to John E. Young, Ruth, Oct. 22, 1929, for 2 c.f.s. from Littlefield Creek in Sec. 31, T. 2 S., R. 8 E., H. B. M., for irrigation and domestic purposes. Estimated cost \$500.

TRINITY COUNTY—Permit 3353, Application 6280. Issued to Gus Perigot, Blue Lake, Oct. 29, 1929, for 125 c.f.s. from New River in Sec. 30, T. 6 N., R. 7 E., H. M. for mining purposes. Estimated cost \$200,000.

Applications for Permit to Appropriate Water Filed with the State Department of Public Works, Division of Water Resources, During the month of October, 1929.

BUTTE COUNTY—Application 6449. Holly Citrus Land Company, 2020 N. Oxford Ave., Hollywood, for 1.25 c.f.s. from 2 unnamed streams tributary to Wyandotte Creek, Honcut Creek and Sacramento River to be diverted in Sec. 6, T. 18 N., R. 5 E., M. D. M., for irrigation purposes. Estimated cost \$25,000.

CALAVERAS AND SAN JOAQUIN COUNTIES—Application 6458. Ralph G. Houston and Raymond W. Miller c/o A. L. Cowell, Atty., Stockton, for 150 c.f.s. from Calaveras River tributary to San Joaquin River to be diverted in Sec. 5, T. 2 N., R. 9 E., M. D. M., for irrigation and domestic purposes.

DEL NORTE COUNTY—Application 6456. Russell Reid, c/o Geo. D. Grant, Crescent City, for 1 c.f.s. from Branch Creek tributary to High Prairie Creek to be diverted in Sec. 28, T. 14 N., R. 1 E., H. M., for irrigation and domestic purposes. Estimated cost \$200.

DEL NORTE COUNTY—Application 6453. Mrs. E. F. Raymond and Sons, c/o Austin Raymond, Crescent City, for 5 c.f.s. from Patrick's Creek tributary to Smith River (Middle Fork) to be diverted in Sec. 9, T. 17 N., R. 3 E., H. M., for power purposes. Estimated cost \$5,000.

EL DORADO COUNTY—Application 6459. Mrs. M. E. Drussell, 393 Randolph, Napa, for 200 gallons per day from unnamed spring tributary to South Fork American River to be diverted in Sec. 15, T. 11 N., R. 17 E., M. D. M., for domestic purposes. Estimated cost \$150.

INYO COUNTY—Application 6468. The Ballarat Mining Corporation, Ballarat, P. O. Box 246, Trona,

for 0.06 c.f.s. from Sunset Spring, Jack Pot Canyon, tributary to Panamint Valley Sinks to be diverted in Sec. 12, T. 22 S., R. 44 E., M. D. M., for mining and milling purposes

INYO COUNTY—Application 6466. American Potash and Chemical Corporation, Trona, for 0.0544 c.f.s. from Christmas Spring tributary to Searles Lake to be diverted in Sec. 26, T. 24 S., R. 42 E., M. D. M., for industrial, domestic and mining purposes. Estimated cost \$4,840.

INYO COUNTY—Application 6460. John H. Thorndike, c/o Chandler, Wright & Ward, Attys., Bartlett Bldg., Los Angeles, for 0.10 c.f.s. from unnamed spring tributary to Wild Rose Canyon Watershed to be diverted in Sec. 3, T. 20 S., R. 45 E., M. D. M., for irrigation and domestic purposes. Estimated cost \$2,000

MENDOCINO COUNTY—Application 6464. Thomas S. Van Fleet, 333 High St., Turlock, for 0.5 c.f.s. from West Branch of Russian River tributary to Russian River to be diverted in Lots 25, 26, 27, Calpella Fruit Land Tract No. 3, for irrigation purposes. Estimated cost \$1,000.

MERCED COUNTY—Application 6470. San Joaquin Light and Power Corporation, c/o J. W. Jourdan, Dist. Engr., Fresno, for 1750 c.f.s. from Merced River tributary to San Joaquin River to be diverted in Sec. 4, T. 5 S., R. 15 E., M. D. M., for power purposes. Estimated cost \$400,000.

MONO COUNTY—Application 6463. Telge E. Hardy, Coleville, for 1 c.f.s. from four small springs tributary to no stream to be diverted in Sec. 12, T. 8 N., R. 22 E., M. D. M., for domestic and irrigation purpose. Estimated cost \$3,000.

PLACER AND NEVADA COUNTIES—Application 6465. Bear River Water & Power Company, c/o Dr. J. L. Rollins, Colfax, 110,000 acre-feet per annum from Bear River and its tributaries tributary to Feather River to be diverted in Secs. 27 and 22, T. 15 N., R. 9 E., M. D. M., for power purposes. Estimated cost \$2,500,000.

PLUMAS COUNTY—Application 6469. Henry Hollye, Twain, for 0.025 c.f.s. from unnamed spring tributary to East Branch of North Fork of Feather River to be diverted in Sec. 21, T. 25 N., R. 8 E., M. D. M., for domestic and irrigation purposes. Estimated cost \$200.

RIVERSIDE COUNTY—Application 6462. Motor Transit Terminal Corporation, 220 E. Market St., Los Angeles, for 1 c.f.s. from a series of ponds and swamps, unnamed, tributary to Santa Ana River to be diverted in Sec. 31, T. 2 S., R. 6 W., S. B. M., for irrigation and recreational purposes.

SAN BERNARDINO COUNTY—Application 6455. Geo. R. Hicks, 527 3d St., Banning, for 2.5 c.f.s. from Upper Little Morongo Creek tributary to Mission Creek to be diverted in Sec. 2, T. 1 S., R. 4 E., S. B. M., for irrigation and domestic purposes. Estimated cost \$200.

STANISLAUS COUNTY—Application 6467. Alexander J. Silveira, c/o Brown & Chamberlain, Attys., Modesto, for 0.5 c.f.s. from San Joaquin River tributary to Suisun Bay to be diverted in Sec. 8, T. 6 S., R. 9 E., M. D. M., for irrigation purposes.

SUTTER COUNTY—Application 6451. James R. Young, Crammore, for 1.94 c.f.s. from Sacramento River tributary to Suisun Bay to be diverted in Sec. 14, T. 13 N., R. 1 E., M. D. M., for irrigation purposes. Estimated cost \$5,000.

SUTTER COUNTY—Application 6457. E. H. Christenson & Son, Route 3, Yuba City, for 10.96

c.f.s. from Sacramento River tributary to Suisun Bay to be diverted in Sec. 28, T. 13 N., R. 3 E., M. D. M., for irrigation purposes. Estimated cost \$6,000.

SUTTER COUNTY—Application 6454. Austin Kramer, Knights Landing, for 1.30 c.f.s. from Sacramento River tributary to Suisun Bay to be diverted in Sec. 29, T. 12 N., R. 2 E., M. D. M., for irrigation purposes. Estimated cost \$5,000.

VENTURA COUNTY—Application 6452. Reginaldo Ruiz, Ojai, for 300 gallons per day from 2 unnamed springs tributary to Sespe Creek to be diverted in Secs. 6 and 7, T. 6 N., R. 23 W., S. B. M., for domestic purposes. Estimated cost \$1,000.

YOLO COUNTY—Application 6450. Mrs. Annie Kirkup, Knights Landing, for 9.18 c.f.s. from Sacramento River tributary to Suisun Bay to be diverted in Sec. 23, T. 13 N., R. 1 E., M. D. M., for irrigation purposes. Estimated cost \$5,000.

YOLO COUNTY—Application 6461. Don McKinney, Esparto, for 200,000 acre-feet per annum from Cache Creek tributary to Sacramento River to be diverted in Sec. 5, T. 10 N., R. 2 W., M. D. M., for industrial purposes. Estimated cost \$12,000,000.

AWARDS OF CONTRACT DIVISION OF ARCHITECTURE

PACIFIC COLONY at Spadra—For furnishing and installing concrete pipe drains. Awarded to Fleming Construction Company of Pomona; price \$8,920.

SONOMA STATE HOME at Eldridge—For general work on ward building. Awarded to C. H. Dodd of Stockton; price \$37,850.

For plumbing and heating work on ward building. Awarded to Jos. C. Black of Stockton; price \$7,600.

For electrical work on ward building. Awarded to Latourrette-Fical Company of Sacramento; price \$1,080.

VETERANS HOME, Yountville—For employees cottages. Awarded to the Minton Company of Mountain View; price \$11,527.

RESTORATION OF STOCKADE at Fort Ross, Sonoma County. Awarded to J. M. Eckert of Duncan Mills; price \$1,498.

GATE LODGE at Tahoe Public Camp Ground near Tahoe City. Awarded to N. R. Mayfield of Tahoe City; price \$2,395.

If your nose is close to the grindstone rough,
And you hold it down there long enough,
In time you'll say there's no such thing
As brooks that babble and birds that sing;
These three will all your world compose—
Just you, the stone, and your darned old nose.

The Motorist's Prayer

Teach us to drive through life without skidding into other people's business. Give us chains and preserve our brake linings before we go too far. Help us to hear the knocks in our own motors, but keep our ears closed to the grinding of other people's gears. Keep alcohol out of our radiators and stomachs. Absolve us from the mania of trying to pass others who are going well and fast enough. Above all, open our eyes to guiding signals, our ears to warning bells, and teach us to keep one foot on the brake.—*National News.*

STATE OF CALIFORNIA

Department of Public Works

HEADQUARTERS: PUBLIC WORKS BUILDING, ELEVENTH AND P STS., SACRAMENTO

C. C. YOUNG-----Governor

B. B. MEEK-----Director

CORNING DE SAULES-----Deputy Director

DIVISION OF HIGHWAYS

CALIFORNIA HIGHWAY COMMISSION

RALPH W. BULL, Chairman, Eureka
J. P. BAUMGARTNER, Commissioner, Santa Ana
M. B. HARRIS, Commissioner, Patterson Bldg., Fresno
JOSEPH M. SCHENCK, Commissioner, c/o United Artists Studio, Santa Monica Blvd., Los Angeles
FRED S. MOODY, Commissioner, 640 Kohl Bldg., San Francisco

C. H. PURCELL, State Highway Engineer, Sacramento
GEORGE C. MANSFIELD, Secretary
HARRY A. ENCELL, Attorney, San Francisco

HEADQUARTERS STAFF, SACRAMENTO

G. T. MCCOY, Administrative Assistant
L. V. CAMPBELL, Office Engineer
T. E. STANTON, Materials and Research Engineer
FRED J. GRUMM, Engineer of Surveys and Plans
C. S. POPE, Construction Engineer
T. H. DENNIS, Maintenance Engineer
CHAS. E. ANDREW, Bridge Engineer
R. H. STALNAKER, Equipment Engineer
E. R. HIGGINS, Chief Accountant

DISTRICT ENGINEERS

F. W. HASELWOOD, District I, Eureka
H. S. COMLY, District II, Redding
CHARLES H. WHITMORE, District III, Sacramento
J. H. SKEGGS, District IV, San Francisco
L. H. GIBSON, District V, San Luis Obispo
E. E. WALLACE, District VI, Fresno
S. V. CORTELYOU, District VII, Los Angeles
E. Q. SULLIVAN, District VIII, San Bernardino
F. G. SOMNER, District IX, Bishop
R. E. PIERCE, District X, Sacramento
General Headquarters, Public Works Building,
Eleventh and P Streets, Sacramento, California

DIVISION OF WATER RESOURCES

EDWARD HYATT, State Engineer, Chief of Division
J. J. HALEY, Jr., Administrative Assistant
HAROLD CONKLING, Deputy in Charge Water Rights
A. D. EDMONSTON, Deputy in Charge Water Resources Investigation
R. L. JONES, Deputy in Charge Flood Control and Reclamation
GEORGE W. HAWLEY, Deputy in Charge of Dams

SPENCER BURROUGHS, Attorney
EVERETT N. BRYAN, Hydraulic Engineer, Water Rights

A. N. BURCH, Irrigation Investigations
H. M. STAFFORD, Sacramento-San Joaquin Water Supervisor
GORDON ZANDER, Adjudication, Water Distribution
KATHERINE A. FEENY, Chief Clerk
MABEL PERRYMAN, Secretary
S. T. HARDING, Irrigation and Special Investigations

DIVISION OF ARCHITECTURE

GEO. B. McDOUGALL, Chief, Division of Architecture
P. T. POAGE, Assistant Architect
W. K. DANIELS, Deputy Chief of Division

HEADQUARTERS

H. W. DeHAVEN, Chief Architectural Draftsman
C. H. KROMER, Structural Engineer
CARLETON PIERSON, Specification Writer
C. O. PALM, Chief Clerk
C. E. BERG, Engineer, Estimates and Costs
J. W. DUTTON, General Superintendent Construction
W. H. ROCKINGHAM, Mechanical Engineer
C. A. HENDERLONG, Assistant Mechanical Engineer
W. M. CALLAHAN, Electrical Engineer

DIVISION OF MOTOR VEHICLES

FRANK G. SNOOK, Chief
EUGENE BISCAILUZ, Chief of California Highway Patrol

DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief

DIVISION OF PORTS

Port of Eureka—F. B. Barnum, Supervisor
Port of San Jose—Not appointed
Port of San Diego—Edgar A. Luce

STATE HIGHWAYS IN CALIFORNIA SHOWING THE PRIMARY AND SECONDARY ROAD SYSTEMS AND THE DIVISION OF THE STATE UNDER THE BREED BILL.



CALIFORNIA HIGHWAYS and PUBLIC WORKS

December
1929



DECEMBER IN CALIFORNIA - A STATE HIGHWAY
SCENE IN LOS ANGELES COUNTY

Official Journal of the Department of Public Works
State of California



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Public Work in California is Increasing Factor in Employment

THE FOLLOWING preview of contemplated expenditures for 1930, together with a statement of work available for winter months, was presented at the November meeting of the Governor's Council by B. B. Meek, director of the Department of Public Works:

Total expenditures in California on state and county roads, not including city streets, are estimated at \$88,030,000 for the year 1930. This sum includes state highway expenditures estimated at \$38,030,000 and expenditures on county roads estimated at \$50,000,000.

A total of \$10,000,000 in state highway contracts will be offered to bidders during the first six months of 1930. For the second six months, the contracts offered will total \$7,800,000.

Expenditures to complete projects either under way or now being advertised will total \$14,590,000.

Maintenance expenditures for 1930 on state highways will amount to \$5,640,000 which will be almost equally divided between half year periods.

Figures are not available by which county expenditures can be pro rated as to the particular period in 1930 when they will be expended.

Expenditures upon state buildings during 1930 will total \$4,726,000, of which one-half will be ready for award during the first six months of the year. At the present time, projects are under way and in process of completion calling for a total expenditure of \$2,214,000.

One hundred irrigation districts in California will expend approximately \$10,000,000 during 1930. On flood control a total of \$1,385,400 will be expended during the same period. Of this sum the state and local units

will contribute \$385,400 and the U. S. government \$1,000,000. Expenditures on the investigation into the water resources of California, the most complete and far reaching study of its kind yet made in the United States, will total \$400,000.

WINTER WORK

As winter approaches and seasonal unemployment increases, the importance of public work in providing employment is emphasized.

The extent to which public work is a factor in the labor situation is evidenced by a few figures.

Careful study of highway projects has enabled this work to be spread over a greater per cent of the year than has been the custom in the past. The extent of this work is evidenced by the contracts placed under contract and the contracts pending and projects advertised for the period

from October 30 to November 21, 1929. These figures are:

Work placed under contract-----	\$1,322,600
Contracts pending and advertised_	1,764,600
	<hr/>
	\$3,097,200

To this must be added approximately \$570,000 spent during the same period in the maintenance of state highways. Approximately 50 per cent of this amount goes to labor.

This work has a value even beyond the figures indicated by reason of its widespread distribution over California, and the extent to which local labor and local supplies enter into highway work.

With every highway contract awarded a letter to the contractor has been enclosed, asking him to employ local labor and to purchase supplies locally as far as it is possible so

When President Hoover issued his call for an expansion of public works throughout the nation to relieve unemployment and to stimulate business, Governor Young was able to answer for California that the President's request had been anticipated in this state, and that the policies he advocated were already in force.

With only 25 per cent of the time period of the present biennium past, 40 per cent of the highway projects programmed for this biennium are either under contract or advertised for bids. In other words, highway work is being given to the state at a time when public work is most needed.

The Division of Architecture has made a similar record. In the first 25 per cent period of the biennium, it has in the field under construction, or ready for the field, 38 per cent of its total program.

to do. There has been a most gratifying response to these letters. Contractors engaged in highway work are cooperating wholeheartedly in the work of relieving unemployment in the localities in which they are working.

PLANNING PROGRAM HELPFUL

Governor Young's long time planning program for state building construction is resulting in a very important and helpful effect on the present serious unemployment situation. The value of building construction work provided for by the 1929 legislature which is now under way in the field is nearly double what it was at the corresponding time following the sessions of 1925 and 1927, and over six times what it was following the session of 1923.

The figure for 1929 is \$2,256,147 and covers 87 different projects; that for 1927 was \$1,193,843 covering 47 projects; for 1925, \$1,190,856 covering 46 projects; for 1923, \$334,168 covering 25 projects. While relieving unemployment, the state is at the same time benefiting financially from the low bids now being obtained.

WATER RESOURCES GIVE WINTER WORK

While the work of the Division of Water Resources, as far as total expenditures, is not as impressive as that of the Division of Highways and the Division of Architecture, yet the work of this division is important from an unemployment point of view, inasmuch as the normal winter work is greater than that of summer. It is of further importance both in that it uses local labor very largely, and its operation extends over a wide area. Thus laborers employed by the division in July number 48 as against 115 in October.

The investigation into the water resources of California now under way is the most complete and far reaching study of this kind ever made in the United States. This study is reflected in the increased employment given to engineers. In July of this year the engineer's staff number 60, while in October this was increased to 117, the increase being due to the increased activity in the water resources investigation and the increased duties of dam inspection placed upon the division by the last legislature.

It seems that one of the employees of Henry Ford dreamed that Henry died. He dreamed that he saw the black casket being borne by six of Henry's oldest and most faithful employees. As the casket came by, Henry raised up, looked around, and offered the following suggestion:

"If you would put rollers under this casket, you could lay off five men."—*Sour Owl*.

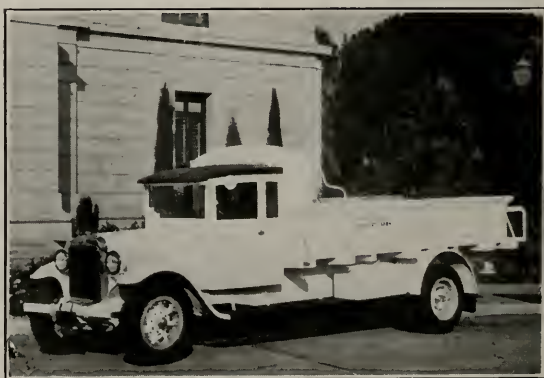
Equipment Made For State Use at Highway Shops



Road Oiler

Attached are two pictures of state equipment constructed at Headquarters Shop.

One is of a road oiler constructed for the Division of Highways and being used in District Four. The other is of a meat truck body



Meat Truck Body

constructed for the Napa State Farm. A letter from Mr. Owen Duffy, Superintendent of the Napa State Farm is attached.

The capacity of the oiler is 1200 gallons. The oil pump is driven by an independent engine instead of a take-off drive from the truck thereby permitting any speed of the pump desired, also, satisfactory pressure of oil regardless of the truck speed.

Another feature of this oiler is that the controls for the spray boot on the rear are arranged so that the operator is facing to the rear, thereby permitting him to see the road as it is oiled.

The meat truck body is constructed entirely of oak, finished in white lacquer and striped and lettered in gold. The inside of the body is natural wood. An offal box is placed on each side fastened to the step board.

NEVADA—It is reported that a road will be constructed between Las Vegas and Boulder Dam on the Colorado River. This highway will be about 35 miles in length and will cost approximately \$600,000.

State Highway Patrol Organized; Districts Fixed; Personnel Selected

WITH DETAILS of organization of the new California Highway Patrol practically completed, California is now ready to take her place among the foremost states of the Union in traffic control.

The new law creating the patrol became effective August 14th. Shortly thereafter, Eugene W. Biscailuz, undersheriff of Los Angeles County, a man with a score of years experience in law enforcement work, was named superintendent.

Since his appointment Superintendent Biscailuz has devoted practically all of his time to working out the reorganization details, conferring frequently with B. B. Meek, Director of Public Works and Frank G. Snook, chief of the Division of Motor Vehicles. These officials have given him the utmost cooperation and have accepted his recommendations with almost no changes.

THE ORGANIZATION

As projected at present, the patrol will consist of a force of approximately 350 men, including superintendent, assistant superintendent, bureau chiefs, district inspectors, captains and patrolmen, all engaged exclusively in enforcing the provisions of the California Vehicle Act.

Approximately one-third of this force will be engaged in night patrol work, in accordance with provisions of the new act.

Squads and their captains formerly operating as county units have been taken over intact and made a part of the patrol.

These men will be on probation for a period of one year. If their services are satisfactory, they will then become permanent members and will receive the protection of state civil service regulations.

Appointments to vacancies will be made

only upon the submission of a list of candidates by the supervisors of the county in which the vacancy exists. The officers, however, will be responsible directly to the superintendent and his subordinate officials and will take orders from them only.

NIGHT PATROL FORCE

The night patrol force will be created in the same manner. The number of men needed in each county will be picked from lists furnished by the supervisors. They will be assigned to the captain in each county for duty day and night. It will be the responsibility of the captain to see that the work arranged is so that all members of his squad take turns at night patrol duty.

COORDINATING CONTROL

With the approval of Director Meek and Chief Snook, Biscailuz has taken the following steps toward the coordination of the work of the patrol:

1. Creation of five major bureaus, with headquarters in Sacramento, to be known

as the Bureaus of Traffic, Schools and Education, Brakes and Lights, Commercial Vehicles and Weights and Statistics and Research.

2. Division of the state into eighteen traffic districts, composed of one or more counties, with convenient headquarters and an inspector in charge of each.

3. Adoption of a standard salary scale for all inspectors, captains and patrolmen.

4. Adoption of a definite, standardized set of rules and regulations for the conduct of the patrol and work of its members throughout the state.

Office details at headquarters will be under the immediate supervision of Roy Youngblood, former undersheriff of San Joaquin

PRINCIPLES THAT GUIDE ORGANIZATION OF PATROL

Every effort is being made to weld the California Highway Patrol into a compact, energetic, highly trained and fast moving force of officers, each imbued with a sense of the responsibility of his job and with the necessity of maintaining the dignity and honor of the Patrol.

Although the organization will not be military in character, the strictest discipline will be maintained, and the personal conduct of the officers, on and off duty, will be scrutinized carefully.

County, who was appointed last month by Biscailuz as assistant superintendent of the patrol. Youngblood is an experienced peace officer and office executive.

TRAFFIC BUREAU

The Traffic Bureau will be headed by Otto Langer, whose work as captain of the traffic squad of San Diego County has earned him a nationwide reputation. Langer's work will



J. J. BORREE

be largely supervisory and advisory. He will map out the beats of the officers in the various counties, find the danger spots, arrange for traffic detours in times of emergency similar to the recent "big game" at Palo Alto, and consult frequently with the inspectors in the various divisions relative to their problems.

EDUCATIONAL WORK

J. J. Borree, former adjutant general of California, heads the Bureau of Schools and Education. He is now proceeding with the task of organizing training schools for the officers throughout the state in accordance with section 30 of the act. In addition, he will be charged with the responsibility of supervising the junior traffic patrols at the schools and with the general education of the public to the needs of careful driving.

STATISTICS AND RESEARCH

Victor W. Killick, for the last four years statistician of the sheriff's office of Los Angeles County, will be chief of the Bureau of Statistics and Research. Killick is a veteran

statistician of the Pacific coast and was founder of the Western Statistical Association, of which he was the first president. His bureau will be concerned largely with the collection and interpretation of statistics relative to the cause and cure of motor accidents. A record of such accidents is required by law.

LIGHTS AND BRAKES

The bureaus of Lights and Brakes and Commercial Vehicles and Weights are still in the process of organization. Their names are explanatory of the duties each will have.

An important function of the Bureau of Lights and Brakes will be to supervise the official brake and headlight testing stations throughout the state. There are more than 1500 headlight testing stations and arrangements are being completed to establish a number of brake testing stations as provided in the new law which sets up a definite standard for two- and four-wheel brakes.

DISTRICT ORGANIZATION

The districts, counties included in each, headquarters, and inspectors were announced as follows:

No. 1—Humboldt, Del Norte and Mendocino counties. Headquarters, Eureka. Inspector, M. F. Brown.

No. 2—Tehama, Shasta, Siskiyou and Trinity counties. Headquarters, Red Bluff. Inspector not yet named.

No. 3—Sierra, Plumas, Lassen, Modoc. Headquarters, Susanville. Inspector, R. L. Sheldon.

No. 4—Marin, Sonoma, Lake, Napa, Solano. Headquarters, San Rafael. Inspector, F. A. Leber.

No. 5—Glenn, Colusa, Yolo, Butte. Headquarters, Oroville. Inspector, J. W. Cooper.

No. 6—Nevada, Yuba, Sutter, Placer and El Dorado. Headquarters, Nevada City. Inspector, F. S. Quinn.

No. 7—Sacramento, San Joaquin, Amador, Calaveras, Alpine. Headquarters, Sacramento. Inspector, G. F. Moynahan.

No. 8—Contra Costa and Alameda. Headquarters, Oakland. Inspector, E. A. Steinmeyer.

No. 9—San Francisco. Headquarters, San Francisco. Inspector, C. D. Reade.

No. 10—San Mateo, Santa Clara. Headquarters, San Jose. Inspector not yet announced.

No. 11—Stanislaus, Merced, Madera, Mariposa and Tuolumne. Headquarters, Merced or Modesto. Inspector, F. J. Duncan.

No. 12—Santa Cruz, San Benito and Monterey. Headquarters, Salinas. Inspector, H. Livingston.

No. 13—Fresno, Kings and Tulare. Headquarters, Fresno. Inspector, J. A. Morrison.

No. 14—San Luis Obispo, Santa Barbara and Ventura. Headquarters, Santa Barbara. Inspector K. C. Murphy.

No. 15—Kern, Mono and Inyo. Headquarters, Bakersfield. Inspector, W. E. Snell.

No. 16—Los Angeles. Headquarters, Los Angeles. Inspector, E. L. Bruck.

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Interrelation of Airway and Highway Transportation

By C. H. PURCELL, State Highway Engineer.*

AIRWAY transportation in the United States is a development which has occurred since the war. At first the only airway lines were mail lines operated by the federal government. Some attempts were made by private agencies to establish air routes but they failed for two reasons: the uneconomy of available aircraft and the lack of popular air consciousness.

In order that all of us may be more familiar with the subject I will briefly note some facts regarding the present status of airway transportation and the conditions which are responsible for this development.

In 1925 national legislation was effected authorizing the Postmaster General to advertise for bids on contract air mail routes whenever he deemed advisable. As a result, contract air mail service came into operation during 1926 on a network of air lines and by the latter part of 1927 the Post Office Department had relinquished its main line operation to private contractors.

Prior to this time and for a short time thereafter the government had operated a few trunk air mail routes.

This act terminated direct governmental participation in the operation of commercial air lines and paved the way for inauguration of transcontinental air express and passenger service.

Commencement of commercial airplane transportation in the United States may properly be considered as dating from the spring of 1926, when the first of the contract air mail routes began operations. Subsequently, air mail contracts have been awarded and operations started on more than a score of routes ranging from short-line feeders to coast-to-coast service, including a route from Miami, Florida, to the Panama Canal Zone, and routes into Canada and Mexico. That some of these contracts have proven profitable, thus placing airplane transportation in the United States on a sound basis economically, and therefore at an advantage over the subsidized lines of other nations, is indicative of the value that American business places on time and

the premium it is willing to pay for rapid transit. Up to the commencement of contract air mail service in this country the capacity of airplane transportation to earn its way had not been demonstrated. None of the nearly 400 attempts to establish commercial air lines in various parts of the world had revenues from transportation business sufficient to meet operation costs.

The American contract air mail lines were soon to change this. Several of them became definitely profitable after a pioneering period much shorter than is usually required to establish new concerns in older and proven fields of business.

Another important piece of legislation was the Air Commerce Act of 1926 which placed upon the Department of Commerce responsibility for developing and maintaining airways, inspecting and licensing aircraft and pilots, and promoting aids to aerial navigation, including radio communication systems.

Airplane passenger service offering daily accommodations on fixed schedule the year around was unknown in the United States until operators of air mail contract routes began to develop passenger traffic as a source of additional revenue. The first effort in this direction was made in connection with the air mail operation between Los Angeles and Salt Lake City in May, 1926, when this line was opened to passenger service. Subsequently, popular interest in commercial travel resulted in the development of extensive de luxe passenger service.

Passage of the transcontinental line from government operation to private hands also paved the way for nation-wide air express service. At the inception of contract air mail service many of the operators offered a field-to-field package delivery which was not a very satisfactory accommodation and attracted only limited use. The possibilities of such a service had, however, been long under consideration by the express companies, whose officials, in the late summer of 1927, negotiated air express contracts with four of the principal air mail carriers. Early in 1928 this air express service was extended to most of the other air mail lines.

* This paper was read by Mr. Purcell at the annual meeting of the American Association of State Highway Officials held in San Antonio, Texas, November 11th to 14th.

The principal services performed by airway transportation are mail, passenger, and express.

In industry, finance, law, agriculture, merchandising—wherever time is an element of any transaction—air mail may be turned to advantage. The air mail service of the United States now extends to practically every major city of the nation and correspondence destined for points 600 miles or more distant from post office of origination will be advanced several hours in delivery by air mail. The air mail line between Pacific coast points and New York City is only one-third of the time required for rail mail. With completion of airway lighting, making night flying possible, there will be but one business day lost between Atlantic and Pacific coast points.

An interesting study deals with the concentration of population necessary to support an air mail operation. Circumstances of location and accessibility through surface transportation agencies will, by influencing the comparative value of airway transportation, affect the air mail volume to be developed in any territory. Generally speaking, excepting where peculiar local conditions intensify the time-saving value, it appears that the air mail volume to be anticipated from any area of less than 300,000 population is insufficient to warrant flying daily both ways over a 200-mile airway. As airplane operation costs are lowered and the time between the airport and the delivery to the post office is reduced the benefits of air mail may be extended to smaller cities and communities nearer to each other.

At the present time, and until the traveling public becomes better acquainted with airway travel, airway passengers are recruited from three classes: Vacationists who want the experience of flight or desire a quick trip to a weekend resort; business men and women who can turn speed to profitable account; and individuals facing personal emergencies which demand their immediate presence at distant points.

As to the first group the question of speed is of small consequence excepting as it extends the range within which a limited vacation period may be spent or permits of more playtime by cutting down the time spent in travel. For instance, under presently available accommodations, a New Yorker desirous of visiting the Pacific coast and having but one week of vacation would find himself in this situation: By rail his entire vacation would be consumed in travel on the fastest trains and he would have to make closest connections in order to complete the journey on time. By airplane only 60 hours would be spent in

travel, leaving four and one-half days for recreation. In other words, the airplane has in point of time brought transcontinental travel within range of a vast group of workers who have a minimum of leisure from the necessity of employment.

At one of the recent football games on the Pacific coast a number of enthusiastic fans came to the game a distance of 400 miles by airplane while others used the airplane to come 35 miles from a nearby city in order to avoid the usual highway traffic congestion. More than 80 airplanes were parked near the stadium.

It is from the second and third groups, however, that under present costs air travel volume can best be developed on a sound basis. From the standpoint of business, in the main, it is conservation of business time that counts. That is, to offer an advantage the airplane schedule must be such as will make available to the user a greater portion of the business day. An airplane schedule which does not offer such saving over available surface transportation systems has little to attract the patronage of business. For instance, business will not pay a higher rate to travel by airplane between two points if its purpose can be equally well or better served by using the cheaper agencies of surface transportation. With present available equipment travel between two cities twenty-four hours apart by rail can, by airplane, be accomplished in from six to eight hours. Daylight flying, of course, would so cut into the business day as to make this of small value excepting in emergencies; or in cases where such flight would permit making a night connection with other form of transportation, to final destination with consequent saving of an entire business day.

Night passenger service on the air mail lines has been fairly well patronized but widespread development of this must wait improved equipment and refined practice.

Passenger airplane service appealing to business for its patronage must be guided by two restrictions on operation. If it is to serve merely the speeding up of long haul travel it should aim at covering by flight a distance traversed by rail in approximately eighteen to twenty-four hours at least. That is, from six to eight hours of flying time are required to give any decided general advantage. If the service, however, is between two major cities, the expenditure of so much daylight time in the air plus the ground time between business districts and airports would consume the entire business day and destroy any general advantage. Three hours of flying plus one hour of ground travel appears to be the

New Road Reveals New Standards

By C. H. WHITMORE, District Engineer.

THE Division of Highways has completed the paving of 8.7 miles of state highway on the Pacific Highway north of Sacramento.

The portion of the highway is more particularly described as being located between Ben Ali and Sylvan School. This is a very important state highway route, being a portion of both the Pacific and Victory highways. Travel to and from eastern points over the

Additional ground area was obtained before construction and, at the present time, the state has a right of way 100 feet wide throughout the length of the improvement.

The alignment of the improvement followed closely the former alignment with adjustments where necessary to eliminate the short radius curves. A new grade of more uniform character was laid throughout the entire distance.

The work consisted of constructing a graded



The new highway north of Sacramento. The views show the highway in process of construction, in ten-foot strips, with the lower right-hand picture showing a completed section of the road as it crosses a widened bridge.

transcontinental roads are routed over this section of highway, also travel to and from northern points via Roseville and Marysville.

The road prior to reconstruction consisted of an 18-foot bituminous macadam on a 60-foot right of way, and was constructed by Sacramento County, and, since the creation of the state highway system, has been maintained by the state.

roadbed 46 feet wide on the southerly 3.7 miles and 36 feet wide on the remaining 5.0 miles. The paving on the southerly one-half mile consisted of widening the existing asphaltic concrete to uniform 30-foot width. On the next 3.2 miles Portland cement concrete pavement 30 feet wide was constructed in three standard 10-foot strips 6 inches to 9 inches thick and on the remaining 5.0 miles

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A Typical Case of Highway Development

By E. J. BASSETT, District Office Engineer.

BEFORE the advent of the Highway Commission into road affairs, in 1910, with its program for improved highways, the country roads throughout the state were totally inadequate to handle the rapidly increasing flood of automotive traffic. The valley roads and even those near populous centers were poor enough for this new type

demands for safety and comfort, in addition to the enormous increase in the volume of traffic.

In looking back over the results of the past nineteen years, it is of great interest to observe the changes which have been wrought and the effect of those changes in our mode of life, on the progress and development in territories adjacent to highways, on transportation and accessibility to hitherto difficult locations, and particularly the economies which have been brought about in decreased operating costs and time saved. One noteworthy illustration of highway development is apparent on that portion of the Pacific Highway between Redding and Dunsuir, in northern California, a portion of the highway which passes through ten miles of foothill country and fifty miles of scenically beautiful mountainous country, in which the highway has been improved from as villainous a piece of early day construction as one could find anywhere, to a modern high speed road.

At the time the state's highway program was first started in this vicinity, the old county road, oftentimes called the "Oregon trail," was the only means of highway transportation between the two towns. "Oregon trail" was a proper cognomen for this road, built in the days when time was not the essence of travel, but rather when costs of construction and upkeep were all important factors. Improved but slightly by the county, at the time of the first rising wave of automobile traffic it can best be characterized as rough, dusty, crooked, narrow and steep. There are other appropriate adjectives, but they are unprintable. Surfacing and the elimination of other undesirable features were prohibitive as well as impracticable on such inferior construction, as mountain roads are an expensive variety, and few of our mountain counties are financially able to get far in such construction. Traffic was slight on this section at the time, the automobile traffic at its peak in summer rarely exceeding fifty cars per day. The distance between the two points was sixty-nine miles, and the average travel time was eight hours. These eight hours were hours of bumps and dust, and the miles were many where first and second gears were indispensable, while the destination was a goal reached by the traveler with the full realiza-



E. J. BASSETT

of traffic, but the roads in mountainous districts were a hazard pure and simple to the motorist, and the automobiles of those days, inferior as they were to our present models, were frequently incapable of traveling through the mountains even in the dry season.

Improvement came slowly, due largely to the vastness of the highway system, and while it kept abreast of the rapid strides made by the automotive industry for several years, financial stringencies caused a loss of headway and an increasing divergence between the lines of highway progress and of vehicular improvement. The gas tax, however, has now provided ample funds, and the highways of California are forging ahead and more than keeping pace with requirements. How long this condition will continue is problematical, and can not be accurately forecast, in view of the ever increasing speed limits and greater

tion of having been somewhere. Only the hardest drivers would consider attempting the trip except in cases of necessity, so the vacation places and resorts in the Sacramento Canyon were accessible to the public only by train. During the winter the more northerly portions of this section were entirely blocked for several months with snow.

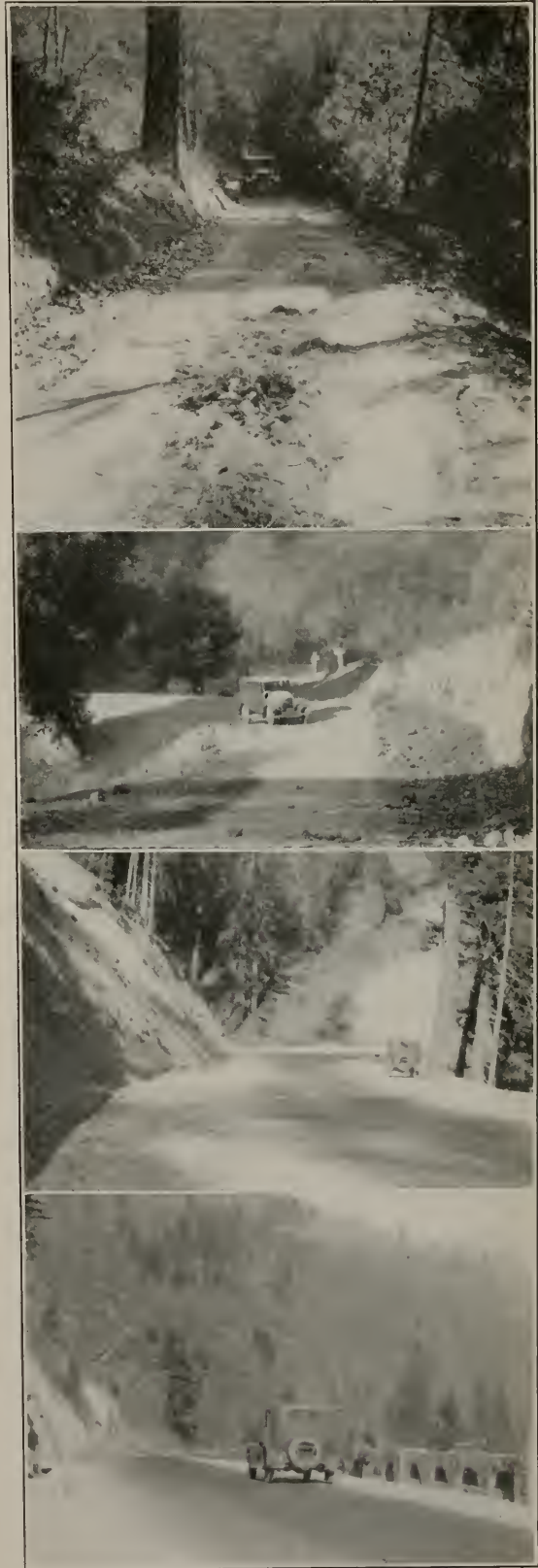
In 1914 the state started active construction, and after several years of delays and difficulties, completed grading of the entire section in 1919. This was followed immediately with surfacing and experimentation with dust palliatives, and produced a road suitable to the demands placed upon it, and in standard of construction far superior to the road it replaced. Suffice to say that during the earlier stages of the construction the users of the road were enthusiastic and thoroughly appreciative of the benefits derived in ease and rapidity of communication.

Comparison of this construction with the old road is, of course, difficult, as the original road was of haphazard development, while the new highway was built on a location chosen only after months of consideration and study, and was consistent with standards of construction then existing. The distance was decreased to sixty-four miles, and the average driving time to three hours, both factors of great value to motorists. The traveled roadway was surfaced with a crushed rock, both manufactured and natural products being used, and had a usable width of sixteen feet throughout, amply safe for a two-way road at moderate speeds. The improvement in alignment and grade over the old county road were incomparable, and even the wheezy and overladen wrecks so common on the roads in those days were able to navigate without assistance or delay. In 1924 the removal of snow during the winter months was provided, adding materially to the commercial use of the road during this period, although the tourist travel comprised a fair percentage, even in the winter season.

Traffic built up rapidly during the eight-year construction period, increasing ever more rapidly as the difficult sections of the old road were eliminated, until in 1922 the peak of the summer traffic averaged around eight hundred cars per day.

Completion had hardly been accomplished when developments in the character of the traffic, increased speeds, greater demands for safety and comfort, and embarrassing comparisons with road improvements in neighboring states brought forth a babel of comment and criticism which could not be ignored. The development of heavy passenger bus traffic, increasing truck traffic demanding fast service, and automotive improvements in the speed capacities of cars, coupled with the demand for a road on which this added speed

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The views in the accompanying column show the growth of the state highway in the Sacramento River Canyon; upper view shows the old county road. Beneath it is a picture of the first state highway constructed in the canyon. The two lower views show sections of the highway built to present standards.

The Relation Between Contractors and the Division of Architecture

By C. PIERSON, Specification Writer, Division of Architecture.

THE PURPOSE of this article is to dwell on the relation between contractors and the Division of Architecture with regard to state buildings.

The question often arises, "Who built the building?" The answer is seldom correct and varies as frequently as it is asked, depending



C. PIERSON

wholly upon the viewpoint of the individual questioned. More often than otherwise, were the question to be asked of the contractor, the answer would be, "Yes, I built the building." This same answer might emanate from the owner, the architect, the engineer, the designer, the superintendent, and all and sundry having aught to do with its construction. Nevertheless, and without attempting to combat anybody's preconceived ideas on the subject, the statement is made that the contractor plays a most important part in the construction of a building. It is he who must organize the force, provide the materials and equipment, lay out the plan of procedure, and take full responsibility for the faithful execution of plans and specifications.

There was a current impression at one time that public work was a thing to be avoided by

contractors; that contractors, who once undertook a public work contract on competitive bidding, would probably lose money, or at least fail to make a profit. The demand for plans for most projects was not great and those contractors who succeeded in obtaining contracts seldom came back to figure other public work. Suffice it to say that no such condition exists at the present time, for we find the same contractors competing time after time together with more and more new contractors, and it not infrequently happens that the same contractor is successful on a number of separate projects.

The relations between the Division of Architecture and contractors who have undertaken to perform public work under the direction of the Division have, as a whole, been very satisfactory and a credit to the state and contractors alike. So satisfactory has been the relation that the state has profited to a large extent by reason of low bids on its building program over a period of several years.

PLANS ARE COMPLETE

In analyzing the situation, several outstanding reasons may be pointed out as at least tending toward making this condition possible. First, and we might say foremost, when a job is advertised for bids, the set of plans which goes into the hands of contractors is as complete as it is possible to make. An earnest and conscientious effort is made to show every item in detail and to leave as little as possible to guesswork on the part of the contractor. Numerous full size details accompany each set, and clear, concise scale details are shown for parts that may not be full sized. Generally, there are both scale and full size details for all particular work. With such a set of details before him, the contractor knows in advance what is expected and can figure his cost without fear of having a more elaborate detail forced on him later.

SPECIFICATIONS GIVE DETAIL

Specifications accompany all plans and are intended to explain in detail the kinds of materials required, methods of construction, types of finishes, and many other details and items that can not usually be shown on plans.

Specifications are drawn with care and with an effort made to explain fully what is required. To a large extent, "cover all" and ambiguous clauses, aimed to force the contractor to perform unforeseen work which might be required but which is neither shown nor specified, have been eliminated.

Clear, concise specifications written in understandable English unquestionably tend to reduce the cost of construction. Lengthy and wordy specifications are often not read completely, and ambiguous specifications tend to increase costs simply by reason of the law of self-protection.

The above statements are not made to give the impression that our plans and specifications are always faultless. Errors creep in occasionally in spite of our best efforts, but



A view in the drafting room of the State Architect's office

on the average the state's plans are as complete and more so than most.

HOW CHANGES ARE CARED FOR

When changes are made, requiring extra work, the extra work is paid for. Changes in plans and specifications are necessary at times after a contract has been let due to developed conditions, no matter how carefully they have been drawn. Such changes are cared for by change order; and when extra work of this nature is given to a contractor, he is allowed his cost, plus a reasonable amount for overhead and profit.

ASSISTANCE IN FIELD

In the field and in the office, every possible assistance is rendered the contractor and the results of such cooperation have been very gratifying. As a general result, there has been a growing demand for state plans, and the interest displayed when work is advertised for bids warrants the belief that contractors are losing their antipathy toward figuring public work. There has always been a certain de-

mand from big centers but of late requests are coming from the more remote quarters. With such widespread interest, the competition has been increased and closer estimates have resulted.

With such keen competition, the assumption might readily be made that some contractors are performing work at a loss. Were it not for the fact that the same contractors compete time and again, this might be considered a fair assumption, but it is hard to conceive of a contractor standing a loss more than once; therefore, it is to be concluded that state contracts are remunerative in spite of competition and low prices.

CONTRACTORS PROVE RESPONSIBILITY

Out of hundreds of contracts let by the Division of Architecture, only a fraction of one per cent of the contractors have failed to live up to the terms of their agreements in one way or another. This speaks exceedingly well of the contracting fraternity as a whole.

It has always been the policy of the Division to look into a contractor's financial condition and experience before awarding a contract to him. Up until August 14, 1929, it was necessary to delay awarding of contracts until the contractor's experience and financial condition could be checked up. This information was not always forthcoming or easily obtainable, and often ten days or two weeks time would elapse between the opening of bids and the awarding of contracts solely for lack of this information.

Under a law passed by the legislature of 1929 and approved by Governor Young, the Department of Public Works is authorized to require contractors to prequalify before plans and specifications for duly advertised public work can be issued to them. This is known as the "Prequalification Law," chapter 644, 1929. Under its terms, contractors who have previously filed answers to a questionnaire, satisfactory to the Department of Public Works, will receive plans and specifications upon request, but others who have not filed their answers, and who request plans, will be delayed in the receipt of same until they comply with the requirements of this law.

Accordingly, a questionnaire was prepared and forwarded to all contractors upon their request, and these are now being received, checked, and filed. The questionnaire covers the experience and financial condition of the individual, copartnership, or corporation, as the case might be, and must be sworn to and audited by a public accountant. By having this information on file at the time bids are received, awards can be made without delay.

(Continued on page 28.)

Scenic Highways and Billboards

By FRANK H. MCKEE, Director of Highways, California State Chamber of Commerce.

THE HIGHWAYS of California have presented many and varied problems. Some of these have been engineering in character and many other economic. The California State Chamber of Commerce with the interests of the state in mind has, through its highway committees, given of its time and best thought in an effort to cooperate with the properly constituted authorities in effecting a solution to these problems, particularly where the economic factor of highway development was at stake.

Our highway system must expand to reach into sections not now served with proper transportation facilities and due consideration must also be given to making more accessible to both resident and visitor various scenic regions of the state. However, the question before us now is not that of planning future projection of the highway system but rather an economic question pertinent to it. Change a dirt road to a highway and business, as exemplified by garages, auto camps, soft drink stands, eating houses, and advertising signs immediately follows. These are business enterprises with an increasing amount of investment involved and in many cases these little groupings have formed the nucleus around which communities have grown. In certain instances, these are unsightly and some people have expressed the opinion that they should not be allowed to exist.

This feeling has prompted a study by the Highway Committee of the California State Chamber of Commerce in an effort to arrive at a commonsense and practical plan for meeting the situation.

COMMERCIAL HIGHWAYS

Let us first get the true picture of our highways. Their essential purpose is to speed up travel between cities. By far the greater number of those using the highways are on business errands—salesmen, merchants, buses, trucks—all welcome the well paved highway as a time saver. To them, it is only an extended city street and the time is not far in the future when, with our rapid population growth, our main highways will be successions of small towns with the highway itself serving as their main street. To take care of the needs of this traffic, business enterprises have sprung up and their continued existence bespeaks

their popularity. They serve an evident need; they are part of our business structure, and must be recognized as an economic factor in community growth. It is a well known practice in subdividing property adjacent to the highways to set aside the frontage for business purposes. Many, in fact practically all, of these highway enterprises have erected signs describing the character of their business. Some of these signs are on their own premises, others on property facing the highway but some distance from their particular location. These signs are essential for attracting trade; without them the location and character of the establishment would be lost and trade suffer accordingly. Commercial highways with their attendant business enterprises are recognized as being part and parcel of our business life.

SCENIC HIGHWAYS

However, the picture changes when we leave the commercial section of these highways and come to points of natural scenic beauty. The greatest value of a scenic spot is its natural beauty; to mar it in any way would be an economic mistake. These sections should be kept free from objectionable shacks and buildings, commercial enterprises and advertising signs. There is such a unanimity of opinion on this point, and as it has received some publicity and public discussion, ways and means of putting a practical plan into operation for the preservation of these spots was started.

LEGAL ASPECTS

The first thought was to look to legislative measures for the proper enforcement of a plan that might be evolved. Realizing that certain legal rights were involved, a letter was written the office of the Attorney General of California asking specifically as to the rights of regulation "of cheap and disreputable vending stands and certain obnoxious sign boards which mar the natural beauty of scenic highways." An extract from the written opinion of Attorney General U. S. Webb, which was sent in reply to our communication, follows:

Where public morals, health, safety, peace, etc., are involved in the exercise of its police power, government may go far in regulatory and even prohibitory measures. But when neither of these elements are present, government can do little in

the restriction of personal liberty or in the regulation of the use of private property.

PROPERTY OWNER KEY TO SOLUTION

This opinion from the Attorney General pointed out very definitely that the owner of the property abutting on the highway controls the situation as far as the elimination of unsightly structures and advertising signs is concerned regardless of the scenic values of the location. Further investigation revealed the fact that there are laws now on the statute books "prohibiting the placing or maintaining of signs, mechanical devices, transparencies, pictures or advertisements on or upon property of the State of California, or on or upon property of any city, city and county, or county in the State of California, and prohibiting the placing or maintaining of any signs, mechanical devices, transparencies, pictures or advertisements upon property of any person or private corporation *without consent in writing therefor having been first obtained.*" It is evident that further legislation is unnecessary as the whole matter comes back to the fundamental invested rights of property.

REPORT OF STUDY COMMITTEE

With these facts before us a study committee was appointed with instructions to go into the matter in detail. The primary feature of their recommendations is the urging of various chambers of commerce to determine what sections in their neighborhood are generally recognized natural scenic beauty spots and then to secure the cooperation of the property owners in their preservation.

RESULTS

The various regional committees, in cooperation with local organizations, determined on certain definite areas, almost without exception on the State Highway System (this in order to pursue a concentrated program rather than one widely spread), and immediately commenced to circulate pledge agreements which bind the owners of land fronting on these highways to allow no signs on their respective properties. This agreement is in the form of a legal document and may be filed with the county recorder.

Realizing the tremendous benefit which would immediately accrue to the properties on scenic highways, the following have already agreed to participate in this program: Southern Pacific Company, San Joaquin Light and Power Company, Pacific Gas and Electric Company, Red River Lumber Company, Southern California Edison Company, Yosemite Portland Cement Company, Little

River Redwood Company, the National Forests and National Parks Service, Harry Chandler, William Randolph Hearst, Spring Valley Water Company, the Charles Nelson Company, Hammond Lumber Company, Harrison Investment Company and the Great Western Power Company.

As evidence that this campaign is actually effecting sign removal, the following quotation was taken from a letter from one of those already signing the petition:

We have already written letters to some parties who had signs along the highway on our property in the Lagoon area, but for which we never have made any charge. We also are sending one of our men along the highway through our property, and are removing from all the trees and landscape any signs or cards that have been placed there.

In addition, the campaign has stimulated activity on the part of county authorities in that they are causing to be removed signs which have been placed illegally on county rights of way. An energetic supervisor in a San Joaquin Valley county had his road foreman gather in three truckloads of signs from within his own supervisorial district.

WANTS SPECIAL ROAD FOR RECKLESS DRIVERS

Every time we pick up our Monday paper we are reminded of news from the front during the late war. In big headlines the dead and wounded are told of as a result of the Sunday auto accidents, and the stories are sometimes more sanguinary than the war reports, which, added to the killings and maimings during the week, make a record unparalleled in peace-time pleasures. It does not seem to make any difference how carefully one drives, there is always a number of wild drivers who know no rules and who spread death and destruction along their trail. In view of this condition, we would respectfully suggest to the highway commissions that they maintain two lines of traffic—an elevated one for careful drivers and a lower one for the wild birds, lined on each side with deep ditches so that when they go off the trail it will be a "finish job" so far as they are concerned, and any killings they inflict on others on that trail would not be a loss, the dead being of the same irresponsible stripe as the killers.—Beach, N. D., *Advance*.

QUEBEC—New roads constructed in Quebec during the year 1927-28 covered 878 miles, and in the last five years 4000 miles of high type pavement has been built. There are 10,531 miles of permanently improved roads in the province and 10,000 miles under government maintenance.

A couple of cute young ladies who were visiting a western city decided that they would go horseback riding, we are told, and the head groom asked one of them whether she would prefer the flat English saddle or the western saddle with a horn.

"The flat saddle," said the young thing, "because we aren't going to ride in any traffic and won't need a horn."

The San Gabriel Dam Report

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ON NOVEMBER 26TH Edward Hyatt, State Engineer, disapproved the application of the Los Angeles County Flood Control District for authority to construct the so-called San Gabriel Dam in Los Angeles County, on the grounds that the dam, if built as proposed, would be unsafe and a serious menace to life and property in the populous San Gabriel Valley below. The dam as planned by the county was to have been a curved gravity concrete structure, nearly 500 feet high, with a storage capacity of 240,000 acre-feet and located at what is known as “The Forks” site just below the junction of the East and West Forks of the San Gabriel River.

The application of the county was filed on October 26 last in accordance with the new law governing the supervision of dams which took effect in August. The State Engineer’s investigations of the plans and the site for the proposed dam were carried on through the medium of a consulting board consisting of three geologists and three engineers, the personnel being as follows:

Charles P. Berkey, Consulting Geologist; Professor of Geology, Columbia University, New York.

G. A. Elliott, Chief Engineer and General Manager Spring Valley Water Co., San Francisco, California.

M. C. Hinderlider, State Engineer of Colorado, Denver, Colorado.

George Louderback, Consulting Geologist; Professor of Geology, University of California, Berkeley, California.

J. L. Savage, Chief Designing Engineer, United States Bureau of Reclamation.

Ira A. Williams, Consulting Geologist, Portland, Oregon.

All members of the consulting board are eminent and experienced in their profession, and no one of them has heretofore been connected with any of the projects of the Los Angeles County Flood Control District.

The board made a joint report to the State Engineer and it was the unanimous conclusion of the six members that a dam as proposed in the application could not be safely built on the foundation existing at “The Forks” site and in line with this conclusion the State Engineer disapproved the application.

Disapproval by the state is without prejudice to the right of the county to file any new application for a dam at this or any other site that the county may wish to submit. It means simply that the state finds that a 500-foot concrete dam, if built on the foundations at this location, would not be safe and this particular application is disapproved.

In its report the board stated that it was its conclusion that a dam of flexible type, such as an earth and rock fill structure of conservative proportions, could be safely built at “The Forks” site. Material storage capacity at this site could be obtained by such a dam. The state is without authority to require any given type or size of dam, but is limited to passing upon applications presented, and it is, therefore, in the discretion of the county as whether or not to file a new application and if so to submit plans best suited to its needs. In such case the state would then independently review such new application and plans from the safety standpoint.

TEXT OF REPORT

The text of the report of the committee follows:

November 21, 1929.

Mr. Edward Hyatt,
California State Engineer,
Sacramento, California.

Dear Sir:

The undersigned, constituting a geological and engineering consulting board, appointed by yourself, to advise on the safety of the proposed San Gabriel Dam in Los Angeles County, respectfully submits the following report.

The plans for the dam are outlined in Application No. D-175, filed in your office October 26, 1929. The filing was made by the Los Angeles County Flood Control District in accordance with the law for the approval of said plans.

The site chosen for this dam is at The Forks, at the junction of the east and west branches of the San Gabriel River, approximately thirty miles northeast of Los Angeles. The plans under consideration provide for a curved gravity concrete dam approximately 500 feet high above foundation, which is about 135 feet higher than any existing dam. The proposed San Gabriel dam would impound 240,000 acre-feet of water at maximum filling, and would exceed by nearly 100 feet the height of the Owyhee dam, the highest of this type attempted to date, now under construction in Oregon by the U. S. Bureau of Reclamation.

Failure of such a dam on the San Gabriel River would endanger life and property in a very large downstream lowland area. The essence of the present study is to consider the safety of the proposed dam.

The purpose of this report is to advise the State Engineer, on whom rests the responsibility of approval or disapproval of the application. The conclusion is based on the coordinated studies of engineering and geologic data as developed by personal inspection of the site and consideration of all other available information.

The natural conditions in the San Gabriel mountains are much more complex than is usually appreciated. Although certain general geologic features prevail, each dam site is a problem in itself, and demands special study and handling.

ROCK FORMATIONS

The rocks of this site and vicinity, are ancient crystalline types, including granitic and dioritic gneiss and occasional schists, all cut by variety of igneous intrusions, including granite, aplite, diorite, diabase, basalt and porphyrites. The result is a crystalline complex, whose detailed history is long and involved, but whose character and quality would be eminently satisfactory for any engineering structure if the rocks had not undergone deformation and decay.

PHYSICAL CONDITION OF THE ROCKS

Deformation.

The rock complex is cut through in every direction by faults and slips and crush-zones, that have separated the mass into blocks of varied size and shape, most of which are comparatively small and roughly wedge-shaped or lenticular. No portion of this site or immediately adjacent ground is free from this condition. In addition, each individual block formed by these fault movements is internally broken, and more or less fractured and jointed, in such manner that most of the material separates readily into small pieces, and there are no extensive bodies of solid rock.

The original structural make-up of the rock formation, with its many different types of varying individual resistance to crushing, has favored the development of internal differential movement, and this has resulted in the meshed and jammed appearance that characterizes the rocks of this site. The rock was not originally weak, but was unevenly resistant, and the forces producing movement have been powerful enough to overcome the resistance of the whole mass.

It is generally conceded that the San Gabriel mountain mass has been thrust up, and that in addition to very large movements on the faults along the boundaries of the mountain block, there are a few zones of major movement cutting through it. One of these zones takes a general east-west course, and has determined the alignment of the east and west branches of San Gabriel River. Another such zone apparently runs nearly north and south, and has been followed by the river in its course below The Forks. The Forks is thus in the junction area of the two fault zones. The unusually numerous fractures at this locality seem to be consistent with this large structural relation.

Disintegration and Decay.

In addition to the faulted and crushed condition of the rock, much of it, especially that on the upper slopes of the canyon sides and along the principal movement planes and crush zones, is extensively disintegrated and decayed. The crushed and pulverized rock along the fault-breaks is often transformed into clay gouge. Some of it is so soft that when moist, it can be molded with the hand.

The surface materials are weathered into soil. By the same process some of the unbroken material beneath is altered or rotted to such condition that it

can be broken easily with the fingers. Along the more fractured zones decay extends as deep as explorations have gone. This altered condition, together with the excessively broken character of the ground, and the smoothed and lubricated movement planes, are controlling factors with respect to any very large engineering structure.

Extent of Weakened Condition.

Observation shows that the crush zones and movement planes and slips occur in all portions of the site, as well beyond the site proper in every direction. Drilling data prove that the same kinds of weaknesses, especially the slips and broken rock and gouge, extend also beneath the site to as deep as explorations have gone.

Landslides are common on the canyon slopes. These doubtless represent the slumping of individual blocks, or groups of blocks, separated from each other by slip planes, when they are weakened by progressive undercutting of a stream, lubrication due to access of water and downward extent of weathering. Relatively recent slides have occurred at the site and at several places in the vicinity.

Where the rock is harder or more uniform than the average, the individual fault blocks are larger, the internal slips and crushes are less numerous, and the accompanying decay correspondingly less extensive. This is the reason for the less broken appearance of the east abutment than that of the west abutment, although there are no different kinds of effects or any other principles represented.

Even the floor of the canyon is not free from this condition. A badly broken zone lies beneath the east third of the canyon bottom, where the bedrock channel is deepest. At this level the east portion of the rock floor of the canyon appears to be less substantial than the west, whereas higher in the canyon sides the west wall is more broken than the east.

Because of the existence of the same conditions beyond the site, together with the less favorable topography both up and downstream, it is not possible to find materially better conditions at any other location in the immediate vicinity of The Forks.

West Abutment.

The character of the rock in the west wall of the canyon, where the proposed dam would rest upon and against it, is displayed in the abutment excavation. It is here shown to be broken through by an intricate system of fault planes with dips ranging from essentially vertical through intermediate angles to flat-lying, and with strikes to nearly all points of the compass. Some of the fault lines may be traced across the excavation in a north-south direction, and they thus parallel the canyon, while others appear to be correspondingly extensive in transverse directions.

Intersection of the fault planes and joints with which the rock is traversed has separated or split the mass of the abutment rock into blocks of all sizes. Evidence of movement between contiguous blocks is the presence of a film or band of clay gouge, which when wet is smooth and slippery clay, and when dry, crumbly and gritty. There is often also a variable thickness of fault-breccia or shattered rock.

The fault planes are lines or surfaces of relatively ready percolation of water, by which alteration and softening of the adjacent rock has resulted. The inner parts of the larger blocks are usually comparatively hard and fresh rock; those of the smaller ones crumbly or in varying states of disintegration.

In excavation, separation takes place most readily along the slip surfaces between blocks. Where these are steep and approach parallelism with the canyon

Eureka Appreciates
Highway Work

Marin Pulls Down
Billboards

Yosemite Valley
Bans Billboards

Commends Traffic
Control at "Big
Game"

Clippings, Letters and Comment



Dealing With State Highways

Editor "Astray" on
State Roads

W. C. T. U. Praises
Highway Patrol

Kind Words Come
From Australia

Carrying California's
Message Abroad

Eureka Appreciative of Highway Work.

The following letter is self-explanatory:

EUREKA CHAMBER OF COMMERCE
Eureka, California, November 20, 1929.

California State Highway Commission,
Sacramento, Cal.

Gentlemen:

The board of directors of the Eureka Chamber of Commerce wishes to convey to you its sincere appreciation for the splendid work done by your body in construction work on the Redwood Highway and laterals these past few years, and especially during 1928 and 1929. We all realize the great benefit this has been to the State of California at large in giving the people access to one of California's most scenic attractions, and you may rest assured that this work on your part is greatly appreciated by this section of California.

Sincerely yours,

EUREKA CHAMBER OF COMMERCE,
President (Signed) Irwin T. Quinn.

* * * * *

"Marvelous Marin" Pulls Down Own Billboards.

This from the San Francisco *Chronicle* of November 26th:

By the time Saturday night rolls around, Marin County will be rid of all billboards advertising the county's charm. A dozen or more were pulled down yesterday and Harry G. Ridgway, president of Marvelous Marin, Inc., personally supervised their demolition.

In eliminating its own billboards, the county is taking a step long contemplated in the north bay region as a result of the program formulated by the Redwood Empire Association's highway beautification committee.

"As Marvelous Marin is affiliated with this association," said Ridgway yesterday, "we believe it would be inconsistent for us to maintain billboards in view of the stand that organization has taken. I realize that the billboard had its definite place in modern advertising and I can see no objection to well designed, well kept billboards when they are so placed they do not detract from the scenery or block the vision of motorists using the highways."

Commends Traffic Control at "Big Game."

Commenting on the manner in which traffic was handled at the California-Stanford football game, the San Francisco *Examiner* editorializes under the heading "Big Game Triumph Proves It Can Be Done," in part as follows:

The handling of the "Big Game" traffic by the state and peninsula motor police set up a target of perfection at which citizens and officers should begin shooting at once.

That immense torrent of steel and humanity flowed peacefully and uninterruptedly to and from the game. It flowed between the banks set by law in far more orderly fashion than do lesser streams of traffic on ordinary days.

The great problem of handling an emergency was met precisely because there WAS an emergency.

The experience with the tangled traffic of the Stanford-University of Southern California game a few weeks before had taught both citizens and authorities the need for law and order.

The motor police of the state and peninsula had thoroughly studied their "Big Game" strategy in advance, so that when the time came they were engineers guiding tons of traffic with their brains, not strongarm men shouting vainly at a brimming river pouring over all its levees.

The next great problem is how to profit fully by this triumph of modern transportation engineering.

* * * * *

Editor "Astray" on State Highways.

R. C. Harbison, editor of the San Bernardino *Sun*, in his column "The Editor Astray," has the following to say:

This California highway system—how it grows on one as he speeds over hundreds of miles of the pavement. Yet it is far from completed, as the report of the State Highway Department shows, and millions are being spent annually to extend and improve it. Special mention should be made of the efficient way in which the improvements are now made. There are few detours. The speedometer shows something over 400 miles from San Bernardino, past many construction gangs, yet only twice have we been off the pave-

ment, once for perhaps two miles past new construction, and once for a few hundred feet where an underpass is being built to avoid a grade crossing over the Southern Pacific.

* * * * *

Napa State Farm Expresses Appreciation.

The following letter is self-explanatory:

State of California
DEPARTMENT OF FINANCE

Yountville, November 4, 1929.

State Highway Commission,
Sacramento, California.

Gentlemen:

I wish to thank you and the members of your department for the splendid workmanship depicted in the body you recently built for the new Napa State Farm truck. It is most satisfactory and has received high praise from everyone who has seen it, in fact, I think it is the best and most carefully built truck body I have ever seen.

I thank you again in behalf of the Napa State Farm for the interest you have taken in this matter.

Very truly yours,

(Signed) OWEN DUFFY,
Superintendent Napa State Farm.

* * * * *

Yosemite Valley Road Bans Billboards.

This Associated Press dispatch was widely published both in California and elsewhere:

YOSEMITE, Nov. 13.—Ninety per cent of the billboards along the all-year highway, into the Yosemite Valley will be removed when their present leases expire, it was announced today by C. G. Thomson, recently appointed Mariposa County chairman of the State Chamber of Commerce campaign to clean up the scenic highways leading to national parks. Thomson said this assurance had been given him by land owners.

* * * * *

W. C. T. U. Praises Highway Patrol.

Papers using the Capitol News Bureau service, published the following article:

SACRAMENTO, Oct. 25.—Their white ribbons may be somewhat dusty, but California highway officers and the W. C. T. U. are one in spirit of temperance and law enforcement, documentary evidence disclosed today.

Congratulatory messages from the temperance organization because of the salutary conduct of patrolmen in session at San Diego, October 15, 16 and 17, simultaneously with W. C. T. U. convention reached Snook today via Captain Otto Langer, newly appointed chief inspector of the California highway patrol, and the news was promptly related to Assemblyman T. M. Wright of San Jose, author of the Wright act and chief of legislative dry contingents.

Kind Words Come From Australia.

The following letter from Australia is self-explanatory:

Department of Geology
THE UNIVERSITY OF SYDNEY

New South Wales, Australia,
15th October, 1929.

The Director,
California Highways and Public Works,
P. O. Box 1103,
Sacramento, Cal.

Dear Sir:

A friend recently lent me two copies of your official journal, Vol. 5, Nos. 2-3, Feb.-Mar. 1928 and Vol. 5, No. 4, April, 1928. These were the first copies of your splendid publication that I had seen, and I found therein matter of considerable interest and value. As lecturer in Economic Geology, including Engineering Geology for students of Civil Engineering in this University, I was keenly interested in the account of the "Six Legged Tetrahedron" and in the full report on the St. Francis Dam failure, as well as in other articles.

Might I be permitted to offer congratulations upon the excellent nature of your publication.

Thanking you in anticipation,

Yours faithfully,

(Signed) L. LAWRY WATERHOUSE,
Lecturer in Economic Geology.

* * * * *

Carrying Message For California.

It will be of interest to know that the message of California is sent through CALIFORNIA HIGHWAYS AND PUBLIC WORKS to the following places and countries out of the United States:

Capetown, Johannesburg, Pretoria, South Africa; Buenos Aires, La Plata, Argentina; Santiago, Valparaiso, Chile; Rio Grande, Brazil; Sydney, South Brisbane, Melbourne, Rockhampton, Australia; Canton, China; London, Yorkshire, Lincoln, England; Paris, France; Monforte, Italy; Cairo, Egypt; Yokohama, Tokyo, Kanagawaken, Japan; Mosco, Baku, Russia; Stockholm, Sweden; Tauranga, Auckland, Wellington, New Zealand; Ancon, Pedro Miguel, Canal Zone; Mexico City, Tijuana, Lower California, Mexico; Honolulu, Hawaii; Camaguey, Cuba; San Juan, Porto Rico; Juneau, Alaska; Vancouver, Victoria, Montreal, Canada; Rotterdam, Netherlands.

* * * * *

Steel Highways From Coast to Coast Forecast.

Highways made of one single strip of steel welded together and extending from coast to coast are predicted by Bennett Chappel, vice president of the American Rolling Mill Company, who recently addressed the annual convention of the International Acetylene Association.

Laboratory-ing California's Highways

By T. E. STANTON, Mem. A.S.C.E., Materials and Research Engineer*

THE SPECTACULAR side of road building, the side which appeals to the public fancy, lies in the operation of power shovels and dirt moving equipment, pavement mixers, and large trucks loaded with materials of construction that travel at high speed over roads already built en route to new work at some distant point.



T. E. STANTON

In due course the grading is completed and the new grade is surfaced according to the number and weight of vehicles the road is expected to carry.

The public takes it as a matter of course that whatever the nature of the pavement it should stand up without serious deterioration and always present a smooth, hard sur-

face free from ruts, bumps, and chuckholes. It is the duty of the highway engineer to see that the public is not disappointed in this respect. To do this, however, he must be sure that the materials and methods used in the construction measure up to certain qualifications which have been determined by observation and research as requisite to insure success.

He has learned that if the foundation soil is of such a nature that it will swell when saturated with water and correspondingly shrink when dried out, it will tend to break up and disintegrate an otherwise economically designed and properly constructed pavement surface.

Having corrected foundation deficiencies by the addition of crushed rock, gravel, or sand there are many pitfalls which must be avoided during the construction of the pavement, such as the quality of the materials (rock, sand, cement, asphalt, steel, etc.) entering into its construction, as well as the manner and pro-

portions in which these materials are put together.

Therefore, so that he may be warned in advance relative to the nature of the foundation soil, and the quality of construction materials to be used, the testing department is expected to keep the construction engineer out of trouble, and when trouble does occur, regardless of the knowledge and best efforts of testing and construction engineers, the research engineer steps in to find out what caused the trouble and devise ways of avoiding the same trouble in the future.

State highway departments in states with limited funds for road building are compelled to call upon commercial testing laboratories for assistance.

States with extensive construction programs usually have their own materials and research department.

California has always maintained its own department.

As the volume and variety of work has increased it has been necessary to gradually increase the facilities of the department until it is second to none in the country.

Probably no state in the Union has such a variety of pavement types under construction and maintenance as California. The size of the state and the wide range of climatic and physical characteristics makes this a logical development.

The wide variety of pavement types makes necessary the employment of laboratory experts in each type.

In addition to the physical testing laboratory, the department has a large and fully equipped chemical laboratory which handles chemical tests and analyses for other state departments, as well as the State Highway Department. The State Purchasing Agent depends on the chemistry laboratory for advice as to quality of much of the materials and supplies purchased for state institutions.

OUTLINE OF WORK

It is the duty of the department to investigate the soil from which the fills and subgrade are to be constructed. Moisture absorption, swell and shrinkage characteristics are studied in the laboratory. After a fill is constructed, if immediate hard surfacing is proposed, borings are made in the fills and tests made to

*This is the first of a series of two articles, dealing with the work of the Materials and Research Department of the Division of Highways. The second article, which will appear in the January issue of CALIFORNIA HIGHWAYS AND PUBLIC WORKS, will deal with some of the particular problems of highway construction upon which research is now being made.

ascertain if full settlement or compaction has been secured. If there is still danger of settlement, the pavement surface is omitted. Assuming that full compaction of the grade has taken place, the subgrade soil is then tested for shrinkage.

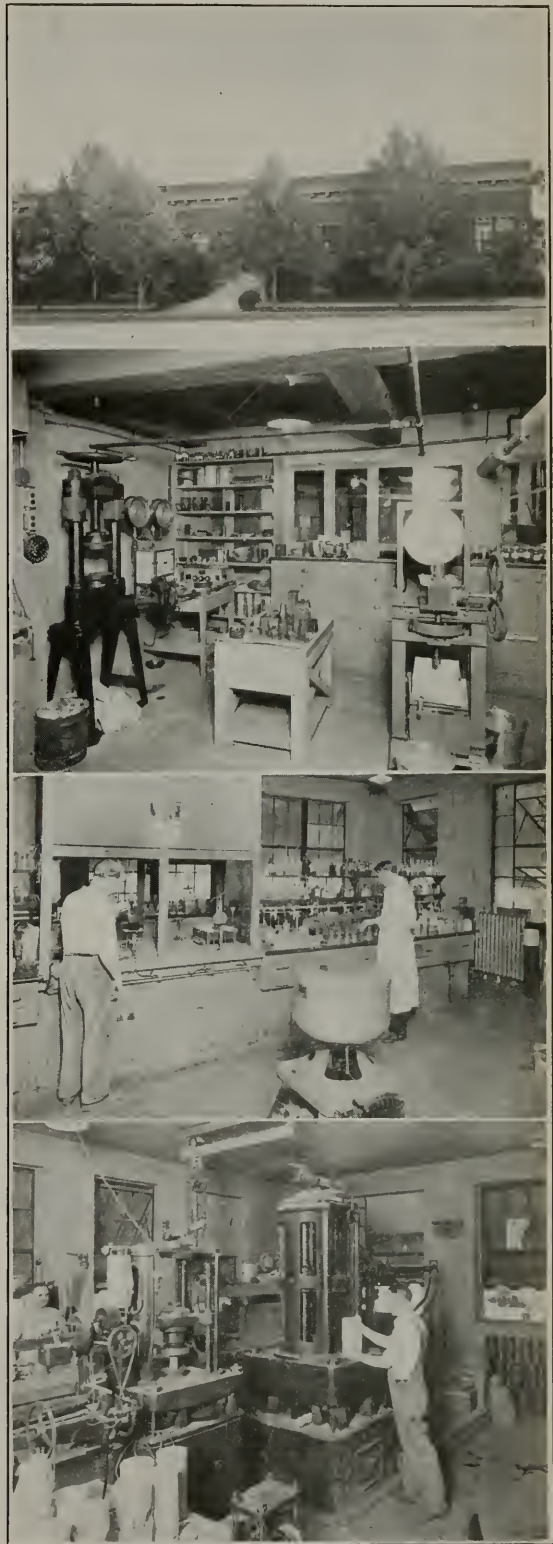
If the subgrade is of clay or adobe which has a high shrinkage value, as determined by laboratory tests, it is first treated or mixed with crushed rock or gravel and opened to traffic until thoroughly compacted. Frequently this subgrade material is mixed with road oil as a dust palliative. If, on account of the volume of traffic or other conditions, it is deemed necessary to pave immediately, the subgrade is first covered with a layer of rock or gravel. Failure to adopt this precaution in the past has frequently been the occasion of an early failure of the pavement surface.

When, for financial reasons or otherwise, an untreated waterbound base of crushed rock or gravel is to be constructed, the material proposed to be used for the purpose is tested at the laboratory to ascertain its resistance to wear. Determination by approved laboratory methods is also made of its binding value. If deficient in binding value, suitable binder material must be provided. Laboratory tests are made on the binding value of different fillers proposed for use, including tests to insure that the filler is of such a nature that it will not swell and mud up under traffic when wet.

If the surface is to be oiled, the materials engineer must ascertain the proper grade of asphaltic oil which should be used for the work proposed. When the oil is received it must be tested to insure that it has not been injured in the process of manufacture. Advice is furnished relative to the proper amount of oil for the aggregate which the contractor proposes to use. During the process of construction, samples of the completed work are forwarded to the laboratory for analysis and separation into component parts to ascertain if they are actually being put together in the proportions and manner which will insure the best results.

In asphaltic concrete pavement construction laboratory tests are not only made of the quality of the materials used in the work but also tests of the completed work to determine composition and stability of the compressed pavement mixture.

In Portland cement concrete work tests are made of the cement, as well as of the rock and sand. The cement is tested and the approved tested cement kept in sealed bins and released for construction projects on authorization from the laboratory.



Upper view shows testing laboratory in Sacramento. The three lower views show scenes where analysis and tests of highway materials are being made.

Grading, specific gravity, soundness, and void determinations are made of the rock and sand used in asphalt and Portland cement concrete construction, and advice furnished to the construction engineers relative to the proper proportioning of the materials which will give the best results. The work is frequently inspected in the field by representatives of the laboratory.

Concrete field cylinders and cores from the finished pavement are tested for strength on the crushing machines at the laboratory. Concrete beams are cast and broken in the field during the construction to ascertain when the new pavement is of sufficient strength to be opened to traffic.

Soil and aggregate is tested for detrimental alkalis and sand for organic matter.

Chemical analysis is made of water proposed for use in constructing concrete, as well as of the water used for domestic consumption in survey, maintenance, and construction camps.

Metal culvert material is inspected and tested chemically.

Steel reinforcing, structural steel and castings of iron and bronze are inspected at the mill and in the field and are tested physically and chemically in the laboratory.

Timber is inspected at the mill and in the field and when necessary is tested physically at the laboratory.

Paint is sampled and afterwards analyzed at the laboratory.

Expansion joint material is tested.

Everything else being equal, the volume of routine testing performed at the laboratory increases in direct proportion as the volume of construction increases.

There has been an increase in the demand on the testing laboratory following a better understanding of the part which thorough and rigid inspection and control of construction materials and methods bears to the quality of the completed work. The cost of laboratory control is cheap insurance.

As evidence of the rapid increase in volume of this type of work, we can refer to the records of the Division of Highways which show that during the fourteen years from the beginning of the state highway program in 1912 to 1926 an average of 3500 tests per year were made.

During the subsequent two-year period from July, 1926, to July, 1928, there were 26,519 tests performed, or 13,260 tests per year. From July, 1928, to July, 1929, the number increased to over 18,000 for the year. During the first four months of the current fiscal year, from July to October, inclusive,

over 10,000 routine tests were made, and, in addition, approximately 20,000 salinity analyses of water for the Division of Water Resources.

To handle this large volume of routine work a thoroughly systemized organization is necessary.

To avoid confusion there must be a positive method of handling and recording samples when received and reporting tests when completed.

The variety of materials tested and the different tests and analyses to which most of the material must be subjected requires the use of carefully worked out printed cards and other forms.

ORGANIZATION

The organization is divided into five departments for routine tests with department heads in charge.

Work is distributed as follows:

1. Aggregate and Soils Department.

Field investigations and sampling of rock, sand and gravel deposits.
Inspection of rock plants.
Screen, sieve and wash analyses, rock and sand.
Void determination, rock and sand.
Specific gravity determination, rock and sand.
Soundness determination (L. A. Rattler) rock and sand.
Organic matter determination.
Alkali determination.
Silt determination.
Binder value determination (filler for waterbound base and surface).
Soils (shrinkage and moisture equivalent).
Compaction (roadway fills).
Screen analysis of fillers.
Miscellaneous tests and analyses.

2. Asphalt Department.

Sampling asphaltic cement, oils, asphaltic concrete, and oil mixtures.
Determination of proper grading of aggregate and percentages of asphaltic cement and oils for asphalt concrete base and surface mixtures, asphalt macadam and asphaltic oil mixes.
Determination of percentage of bitumen in field samples.
Determination of solubility of asphalt.
Determination of loss at 325°, penetration and viscosity of asphalt.
Determination of specific gravity of mixtures, asphalt, oils, etc.
Determination of flash and fire points.
Determination of stability of asphalt mixtures by Hubbard and Skidmore methods.
Determination of water in oil and aggregates.
Design of asphalt concrete mixtures.
Field inspection and advice on going contracts.
Miscellaneous tests and analyses.

3. Chemistry Department.

(Conducts chemical tests and analyses for all state departments.)
Analyses of paints, oils, varnish, shellac, etc.
Analyses of cement.
Analyses of corrugated metal pipe, reinforcing and structural steel, metal lath, etc.
Analyses of lubricating and fuel oils.
Analyses of asphaltic cements and emulsions.
Analyses of glue, coal, etc.
Analyses of prepared roofing paper.
Analyses of belting.
Analyses of water for domestic and construction use.
Miscellaneous, including soap, waxes, calcium chloride, earth, clay, fillers, etc.

4. Concrete Department.

Cement sampling and testing, including making neat cement pats, setting time, boiling tests, and briquettes for tension tests.

Portland cement concrete, including making, curing, capping and breaking field and laboratory concrete test cylinders and beams.

Slump and flow table tests.

Sand mortar tests to determine sand strength.

Design of concrete mixtures for pavement and bridge construction.

Field inspection and advice on concrete construction.

Miscellaneous.

5. Steel, Castings, Timber, and Expansion Joint Department.

Mill inspection and sampling of reinforcing, structural, and culvert steel, cast iron, and bronze.

Laboratory physical tests of:

Phosphor bronze

Cast steel and iron

Reinforcing steel

Structural steel

Culvert steel

Asphalt dipping of metal culverts

Expansion joint material.

Mill inspection of timber, including redwood, Douglas fir, pine—treated and untreated.

Miscellaneous.

(This department has field and mill inspectors in the Los Angeles and San Francisco Bay districts.)

MODERN LABORATORY

In order to properly house and centralize the testing and research work, the Division of Highways has erected and equipped a modern laboratory building.

This structure is a one story and basement Class A building of brick, approximately 33 feet in width and 105 feet in length.

The center of the main floor is occupied by stenographic, clerical, and materials and research engineer's offices.

The chemical testing department occupies the west end and the physical testing the east end.

In the basement is located the asphalt department and the moist room of the concrete department. Back of the main building are additional sheet metal buildings which house the steel testing and overflow from the aggregate and concrete testing departments, as well as providing space for general storage purposes. There is a paved yard large enough to include storage bins for the various grades of aggregate used in the special tests.

The laboratory is well equipped with all necessary equipment and instruments for making tests.

SCHOOL FOR CONSTRUCTION ENGINEERS

In order that the field men in charge of engineering supervision on construction projects may have a thorough appreciation and understanding of laboratory control and tests of construction materials, arrangements have been made to have resident and assistant resident engineers spend two weeks at the laboratory in Sacramento where they are given

instruction in laboratory and field control, sampling, and testing of materials.

Assignments for this purpose are made to the laboratory as these men can be spared from the field by district engineers.

It is proposed to combine a moving picture lecture course with the laboratory course. Motion pictures are being taken of good and poor construction methods. Similar pictures, preliminary to the laboratory work, will serve to illustrate methods of making tests.

The same pictures can be shown at the district offices to those who do not have an opportunity to attend the laboratory course at Sacramento.

Laboratory instruction should result in a better understanding of the value of laboratory control and an increase in quality of the finished construction work.

Upon completion of the laboratory course the construction engineer should be able to pass the following examination:

(1) Aggregates and Soils.

Describe methods used at laboratory or in field to determine:

- (a) Screen or sieve and wash analysis, rock and sand.
- (b) Void determination, rock and sand.
- (c) Specific gravity determination, rock and sand.
- (d) Soundness determination, rock and sand.
- (e) Organic matter determination, rock and sand.
- (f) Alkali determination, rock and sand.
- (g) Silt determination, rock and sand.
- (h) Binder value determination. Filler material for waterbound base and surface.
- (i) Shrinkage and moisture equivalent determination of soils.
- (j) Compaction determination of roadway fills.
- (k) Effect of percentage of moisture on compaction of roadway fills.

(l) Equipment used and its operation.

State size of samples required for making above tests.

Describe method of sampling to secure representative sample.

Describe sample cards and laboratory report forms and procedure.

(2) Portland Cement and Concrete.

Describe:

- (a) Method, number and size of cement samples from bins and cars.
- (b) Method of making neat cement pats, setting time, and boiling tests.
- (c) Method of making cement briquettes and determining strength.
- (d) Method of making and curing field and laboratory concrete test cylinders.
- (e) Method of capping, preparing and breaking test cylinders and cores.
- (f) Method of making slump and flow table tests.
- (g) Method of proportioning concrete and determining yield.
- (h) Method of casting specimens and of making flexural tests.
- (i) Water cement ratio and fineness modulus.
- (j) What effect has excess water on strength of concrete and why?
- (k) Describe method of making sand mortar tests.
- (l) What proportions of cement and sand are used in sand mortar tests and why?
- (m) Equipment used and its operation.

(3) Asphalt.

Describe:

- (a) Size of samples and methods of sampling asphaltic cements, oils, asphaltic concrete, and oil mixtures, etc.
- (b) Proper grading of aggregate and percentages of asphaltic cement and oils for asphaltic concrete, base and surface mixtures, asphalt macadam, and asphaltic oil mixes.

(Continued on page 31.)

Mammoth Pool
Reservoir Site
Survey Completed

Reclamation
Flood Control

Review of November Activities

In the

Division of Water Resources

EDWARD HYATT, Chief of Division

Water Rights
Water Resources
Investigation
Irrigation

WATER RESOURCES

San Joaquin Valley Investigation. The survey of the Mammoth Pool Reservoir Site was completed on November 18th. The area covered in this survey was 10,000 acres of very rugged mountainous country. The survey extended from the mouth of Big Creek, elevation 2150 feet, up the main channel of the San Joaquin River, twenty miles, to elevation 3600 feet. Mapping of this survey is one-half completed. Surveys on the Kings River, Kern River Exchange Canal, has been continued throughout the month. Thirty-eight miles have been completed to the Kaweah River. In this survey all railroads, streams, county roads, and state highways are located. Surveys on the lower San Joaquin River have been continued. These include obtaining all changes in alignment and additional artificial works such as dredge cuts, levees, etc., that have been constructed since the survey of the U. S. engineers was made. To date six miles of stream channel have been surveyed, thirty-eight miles of levee traversed, thirty-five miles inspected, and five new cutoffs located. About 15 per cent of the work outlined has been completed. This work has been carried forward from the Mossdale Bridge to the mouth of the Tuolumne River. Topography has been taken by field party, transferred from the Mammoth Pool Survey from the San Joaquin River toward the Kings River for a distance of about nine miles. This will be utilized in making a paper location in the office and then a final location in the field for an exchange canal between these two streams. Observations on the ground water conditions in Kern County area have been made for the year 1929 and forwarded to this office.

Intensive office studies are in progress and partially completed to determine the maximum possible utilization of all local water supplies on the areas susceptible of economic irrigation as determined by the land classification for the purpose of determining in what areas shortages exist and the importations required of foreign water to supplement the local supplies.

Sacramento Valley Investigation. Water supply studies, Sacramento River at Red Bluff and Bieber, and Upper Feather River have been continued throughout the month. Additional studies of yield have been made for the Iron Canyon Reservoir on Sacramento River and Indian Valley Reservoir on Feather River. Preliminary cost estimates have been completed on seven reservoirs on the Upper Feather River.

Classification of lands and crop survey has been continued. Up to date 2,500,000 acres have been covered.

Santa Ana Investigation. Agreement was reached with the representatives of the Tri Counties Associa-

tion on Santa Ana River to conduct investigations of methods of conservation with particular reference to spreading on the cone of Santa Ana River and various creeks from San Gabriel Mountains to Cucamonga Basin. This is in addition to the cooperative work in Santa Ana Basin being carried on by the various branches of the federal government and this office. The matter involved is general plan for construction of works which will enable quantities of water to be diverted from Santa Ana River and spread on the cone where it will sink underground. The aim of the investigation will be to reach a plan whereby quantities of water unprecedented in spreading practice heretofore can be diverted. This involves serious questions of design and control of the stream after it has been diverted.

Salinity Investigations. Work in connection with the salinity investigations has consisted merely of the maintaining of 76 regular salinity observation stations and the compilation of records and data obtained in surveys. Up to date 20,000 salinity samples have been taken and analyzed.

DAMS

As noted in our last report, the activities of this subdivision have been directed first to the prosecution of current work and second to the development of personnel and methods to adequately handle the duties imposed upon the department by the new law covering the supervision of dams, which became effective in August last.

During the present month applications have been received for two new dams, namely, the Sunset Canyon Dam of the Los Angeles County Flood Control District, and the Crouch Dam located in San Diego County. Sixteen applications have been received requesting approval of existing dams, and two applications for repairs or alterations of dams already built. During the present month \$738.85 has been collected in fees by the department.

Regular inspections have been made of the important dams now under construction or being repaired. These are the San Gabriel Dam of the Los Angeles County Flood Control District, Juncal Dam of the Montecito County Water District, Santa Barbara County, Shaver Lake Dam of the Southern California Edison Company, Fresno County, Calaveras Dam of the city of Stockton, Calaveras County, Felt Lake Dam, Stanford University, San Mateo County, Chenery Dam, California Water Service Corporation, Contra Costa County and Lake Almanor Dam of the Great Western Power Company, Plumas County. In addition to the regular inspections and investigations of dams under construction, studies and analyses of the plans of the following dams have been made: San Gabriel, Juncal, Calaveras, Shaver Lake and Hansen.

In our last report we reviewed conditions existing at the San Gabriel Dam and noted that the Los Angeles County Flood Control District on October 26th, filed formal application accompanied by a filing fee of \$14,875.23, requesting approval of the San Gabriel Dam as originally planned. The division will now take jurisdiction and make an investigation of the plans, specifications and foundations.

The report on the San Gabriel Dam investigation will be found on page fourteen of this issue.

IRRIGATION, WATER STORAGE DISTRICTS AND BOND COMMISSION

During the month financial and economic investigations were made of the Naglee-Burk, Palmdale and Little Rock Creek Irrigation Districts.

Petition for the organization of a new district to be known as the Dixon Irrigation District, located in Solano County, was approved by the County Board of Supervisors and filed with the State Engineer for investigation and report of feasibility.

The California Bond Certification Commission held a meeting on November 8, 1929, at which there was a bearing in the matter of the issuance of bonds by the Imperial Irrigation District for the development of their proposed power project.

The California Bond Certification Commission approved an expenditure of \$14,805, by the El Dorado Irrigation District from its construction fund and construction work necessary in the development of the project.

RECLAMATION AND FLOOD CONTROL

Maintenance of Sacramento and San Joaquin Drainage District. The Sacramento by-pass has been cleared of timber growth by A. Mitchell, under contract at a cost of \$875. Routine maintenance work on the project in Sutter County has been carried on, including maintenance clearing in the by-pass channels. A total of about twenty-five men is engaged in this work.

Cooperative bank protection work on the Sacramento River and its tributaries within the Sacramento flood control project is now considered a part of project maintenance, and the money for the state's portion of the cost is obtained from the flood control maintenance fund. Most of the items under this work have been previously reported under "Emergency flood control and rectification of river channels." The projects now under way or under consideration are as follows:

Reclamation Districts No. 533 and No. 673---	\$1,800
Robinson Bend on the Feather River-----	8,000
Sacramento River at Isleton in cooperation with the Division of Highways-----	14,000
Andrus Island in cooperation with Reclamation District No. 556—cost not yet determined.	
Reclamation District No. 730-----	16,000
Reclamation District No. 900-----	2,100
Randall Island in cooperation with Reclamation Districts No. 551 and No. 755-----	525

NOTE.—The above amounts include the total cost, of which the state contribution is one-third.

Emergency Flood Control and Rectification of River Channels. Arrangements have been made for protection at the head of Tyler Island, in cooperation

with Tyler Island Farms and Libby, McNeill & Libby, at a total cost of \$3,060, the work to be done under contract by Leonard Isham of Rio Vista.

Sacramento Flood Control Project. Good progress is being made in the work of by-pass clearing with the money provided from the "Joint navigation and flood control project fund."

In the upper Sutter by-pass and Butte Slough by-pass our own crew of eighty-two men is working under the direction of the maintenance foreman on by-pass clearing construction. These are all local men and no camp is maintained. The employment of these men relieves a serious unemployment situation in that vicinity, and the work is much appreciated. Many of the farmers on account of the hard season found it necessary to obtain outside work. An unusually high class of labor is being obtained.

In the lower Sutter basin, a crew of sixty-three men is camped on our floating river equipment, and is clearing timber adjacent to the river in Sacramento Slough. We have recently established a new camp for clearing operations at the east levee of Reclamation District No. 1500, opposite Lee Station, to accommodate approximately sixty men. This camp will be in full operation within a day or two.

Contract has been awarded to August Dententer of Marysville for clearing work in the channels of the state cut-offs at the junction of the Feather and Yuba rivers near Marysville. This work is approximately 70 per cent complete.

The work under the contract with P. D. Maritsas in the channel of the American River is progressing satisfactorily. He has at this date removed approximately 1100 piles and various other obstructions, consisting mostly of old bridge piers.

Russian River Jetty. On November 17th, the large quarry blast was shot, which broke down approximately 20,000 tons of rock. The shot was very successful, and the material was well broken up and well placed for handling. Approximately fifteen tons of powder were used. The balance of the work this season will consist of transporting this rock from the quarry and depositing it along the jetty. At the present time a crew of nineteen men is employed.

Pajaro River Flood Control. The work of clearing the channel of the Pajaro River is approximately 70 per cent complete and will probably be finished by the twenty-seventh of November. The work is being done by our own force under charge of Mr. Kelley, the river foreman. A total of \$4,000 will be spent on this work.

Mokelumne River Improvement. On November 12 the work of clearing the channel of the Mokelumne River was commenced, in charge of our foreman, Mr. D. W. Roberts. This work is being carried on a day's labor basis, in collaboration with San Joaquin County. Our foreman has complete charge of the work, and one-half of the crew of fifty men is carried on the state pay roll and one-half on the San Joaquin County pay roll. Other expenses and purchases are being divided as nearly as possible on an equal basis. This work is done under authorization of Chapter 447, Statutes of 1929, and a total of \$10,000 is available, equally divided between the county and the state. The work being done consists of clearing timber and brush from certain portions of the overflow channel, and removing snags and other obstructions from the channel proper. The work is progressing upstream from the lowest point, and at present has been confined to the south bank on account of the unusual flow of water in the river.

Flood Measurements and Gages. A small crew has been engaged in putting the automatic and staff gages maintained by this office in proper condition for the winter operation, and arrangements are being made to take the necessary flood measurements should this be required.

WATER RIGHTS

Applications. During the month of October, 22 applications to appropriate water were received; 18 applications were rejected; 17 applications were approved; no permits were revoked; and 1 license was issued.

Other Activities. All other activities in connection with water rights, such as adjudication work, water master service, snow surveys, and the investigations in Southern California and in the coastal basins are going forward in the routine way. Progress is being made but there are no particular items to remark upon, except the conclusion of the Stanislaus River Adjudication Proceedings which is covered in the succeeding paragraph.

Stanislaus River Adjudication Proceedings. On November 14th, the superior court signed findings of fact and conclusions of law and entered a judgment and decree in the Stanislaus River Adjudication. This brings to a close proceedings which were initiated in 1916. This was the first adjudication attempted under the Water Commission Act and during its course many delays have been occasioned by attacks upon the constitutionality and various other features of the act. However, the act was upheld against all attacks and the conclusion of the proceedings was completed on the above date practically 13 years after they were initiated.

The adjudication covers 58 water rights scattered through five counties, Alpine, Calaveras, Tuolumne, Stanislaus and San Joaquin. Twenty-eight hundred and fifty cubic feet per second of direct diversion were decreed and approximately 128,300 acre-feet per annum of storage. The rights decreed provide for the irrigation of over 150,000 acres of land for development of over 50,000 horsepower of hydro-electric energy. The most important claimants whose rights were decreed were the Oakdale Irrigation District, South San Joaquin Irrigation District, Pacific Gas and Electric Company (Stanislaus power development) and the Utica Mining Company.

The findings of the decree are virtually the same as the final Order of Determination made by the Division of Water Rights and thus the decree is the same as the Order of Determination which was entered in 1923.

REGISTRATION FIGURES TELL STORY

The United States leads all other countries in motor vehicle registration, with 24,493,124 units. The entire foreign registration is only 7,285,000. The United States has 3,005,614 miles of roads—its nearest rival is France, with 440,085 miles. Argentina is the leading customer for American-built cars; Mexico has the most automobiles per mile of road with 37; Russia, with .06 has the fewest cars per mile of roads; the United States has the fewest persons per car, with 4.9; China has 17,000 persons for every motor vehicle there.

MOTOR VEHICLE DIVISION REPORTS

FRANK G. SNOOK, Chief

CAMPAIGN AGAINST FAULTY HEADLIGHTS

On October 15th the California Committee on Public Safety and various other organizations, cooperated with the superintendent of the California Highway Patrol in launching an educational campaign against faulty headlights. This campaign of education and warning was carried on for fifteen days. At its conclusion the highway officers, with the cooperation of the city police departments, started rigid enforcement at night throughout the state. The California highway patrolmen issued 12,730 citations to motorists up to November 11th, and we are still actively engaged in carrying out this work. Thousands of citations which have not been reported to the division as yet have been issued by police departments cooperating with the patrol.

EQUIPMENT OF HIGHWAY PATROL

On August 14th the division had 25 automobiles which had been purchased out of surplus budget allowance of the 80th fiscal year. All of these cars have been painted the distinctive color "white," and are now being operated upon the highways throughout the state by various inspectors and captains. Specifications have now been prepared for automotive equipment to completely equip the highway patrol.

HANDLING TRAFFIC AT THE "BIG GAME"

The expeditious manner in which traffic was handled at Saturday's "big game" reflects the value of the newly organized highway patrol.

A special meeting was held at the Cardinal Hotel at Palo Alto on November 8th, at which were present Mayor of Palo Alto, Mr. Albert R. Masters, general manager, Stanford Athletics, the Comptroller of Stanford University, chiefs of police of the various municipalities surrounding the peninsula district, traffic and operating officials of the Southern Pacific Company, the Chief Engineer of the California Automobile Association, a National Automobile Club representative, Superintendent Biscailuz, and other members of the California Highway Patrol, for the purpose of expediting the movement of traffic for the Stanford-California football game and the Stanford-Army game.

Superintendent Biscailuz offered the services of the California Highway Patrol to work in cooperation with the chief of police and traffic forces of the peninsula municipalities, and this offer was accepted wholeheartedly. Maps were furnished to Otto Langer, inspector at large in charge of the Bureau of Traffic, who instructed and placed the 60 men assigned to this work to their respective duties. These men were on

the ground Friday, November 22d, at noon. Stanford University made arrangements to furnish sleeping quarters for all men in one of their dormitories. Elaborate preparations were made, with the cooperation of the other interested officials, to bring about a satisfactory and efficient handling of a very difficult traffic situation occasioned by the lack of more than one major outlet from the stadium to San Francisco.

No traffic officers of the California Highway Patrol were allowed to be in attendance at the game, having been assigned to duty from 8 a.m., November 23d, until the whole situation had been cleared. The press was very helpful in advising the public how best to cooperate with the officers in charge.

INSTRUCT AUTOISTS IN MOTOR VEHICLE ACT

The synopsis of the Motor Vehicle Act has been published, in accordance with a statute passed at the last legislature. This act directed that the synopsis should be given with each original motor vehicle registration. The publication of this synopsis of motor vehicle laws is a part of the state-wide campaign for greater safety in the use of highways.

Governor Young contributed the following statement to the publication:

The highways of California have become the best in the world. Our job now is to make them the SAFEST.

Prevention of motor accidents, and the reduction of resulting deaths and injuries, is a duty incumbent not only on public officials, but on all citizens of the state.

The overwhelming majority of our motorists are careful and law abiding. With these the officers of our Highway Patrol must ever be friends and allies, all striving ceaselessly together to increase public safety.

The menace in highway travel lies with a small motoring minority. In this group are found the reckless and the criminally careless, the drunken and the grossly incompetent. These must be made either to reform or be forever eliminated from our highways.

I appeal to the individual motorist to recognize and ever remember the great outstanding fact that safety laws, even with the most rigid enforcement, will not keep accidents at an irreducible minimum, unless supplemented by safe practices on the part of individual drivers and individual pedestrians.

The goal of an irreducible minimum in accidents is a very proper standard for our California highways. The public should insist on a measure of safety that refuses to excuse any accident that is humanly preventable.

The lives of our people are too valuable to the state, and too precious to themselves and their families to be sacrificed through inattention and negligence.

Many conductors are not sold on the idea of publicity for the construction industry. They ask us what good it will do. Well; we are told that there are twenty-eight mountains in Colorado that are higher than Pike's Peak. We can't name any of them. And neither can you. But we all have heard of Pike's Peak because it has had so much publicity. So business is good in Pike's Peak and the twenty-eight higher peaks just stand there, and, we imagine complain that business is poor, wonder why people flock to Pike's Peak and refuse to believe in publicity—*Construction Advisor*.

NOVEMBER REPORT OF DIVISION OF ARCHITECTURE

GEORGE B. MACDOUGALL, Chief

Contracts of a total value of \$366,149 were awarded during November. Projects on which bids are in but upon which awards had not been made (Nov. 21st) totaled \$329,894. Projects out for bids showed a total of \$31,900.

The list of projects upon which awards were made in November included the restoration of the stockade at Fort Ross; gate lodge at Tahoe Public Camp Grounds; painting work at the state nursery at Swingle; general work, heating and plumbing work; electrical work in reconstruction of ward buildings at the Mendocino State Hospital; addition to the Public Works Building; general work, heating, ventilating, plumbing and electrical work for the library and science building of the San Diego Teachers College.

Bids are now in for the general and complete mechanical work for the two barracks buildings of the Veteran's Home.

NEW ROAD REVEALS NEW STANDARDS

(Continued from page 7.)

Portland cement concrete pavement 20 feet wide was constructed in two standard 10-foot strips 6 inches to 9 inches thick.

Proposals were received on May 22, 1929, the contract being awarded to Frederickson & Watson and Frederickson Bros. of Oakland on a bid of \$323,686.40.

The construction was standard throughout, the aggregates being proportioned at a central proportioning plant located near the center of the work, and hauled in batches to the mixer on the grade, where the cement was added and final mixing performed.

On this job a record average daily run of Portland cement concrete for the state highway work was obtained, being 360.4 cubic yards of concrete per day. The maximum daily run was 407.9 cubic yards.

The final cost of this improvement, including state furnished materials, supplemental work, etc., will be approximately \$360,000, or about \$41,000 per mile.

The contractor employed from fifty to one hundred men per month on this work during its construction.

The pavement was opened for through travel Saturday, November 16th.

Mr. C. A. Potter is resident engineer in charge of the work for the state.

November Highway Awards Described

Twenty-one state highway contracts were awarded by B. B. Meek, director of the Department of Public Works, in the thirty-day period between November 4 and December 4, 1929. The total of contractors' bids on these contracts was \$1,504,950. This work is widely distributed over California. The improvements that will be secured by these contracts may be summarized as follows:

FOOTHILL BOULEVARD—The Johnson Construction Company of Los Angeles was awarded a contract to widen a bridge across San Gabriel River on the Foothill Boulevard near Azusa in Los Angeles County. This contract is a part of the general program of bridge-widening now in progress over California. The existing bridge is 21 feet wide. This is to be increased to a clear roadway width of 42 feet. A five-foot sidewalk is to be constructed on the south side of the bridge. The project will relieve the "bottle neck" at this point, resulting from the recent widening of the adjoining pavement to 40 feet. It lies on the main road between Los Angeles and San Bernardino. The contract price was \$88,054.95.

COAST HIGHWAY—By a contract awarded to Gutleben Brothers of Oakland, a fine new bridge will replace the present old, narrow and dilapidated structure over San Luis Rey River near Oceanside in San Diego County. The new bridge will have three 265-foot steel deck truss spans and two 60-foot steel stringer spans on concrete piers and abutments. The bridge will have clear roadway width of 40 feet and a 5-foot sidewalk on each side. The approaches are to be graded and paved with Portland cement concrete and bituminous macadam. The contract price was \$281,542.

A contract for cleaning and painting the bridge across the Santa Ana River south of Huntington Beach in Orange County was awarded to the L. A. Sandblasting Co. for \$2,350.

A highway widening contract in Los Angeles and Ventura counties was awarded to the Southwest Paving Company of Los Angeles for \$51,361. This contract lies between Calabasas and Conejo Summit. The project is about 19.6 miles in length. The road will be widened with oil-treated rock borders 2 and 3 feet wide, according to the width of the present pavement. This project is a part of the heavily traveled Ventura Boulevard between Los Angeles and Ventura.

Another Ventura Boulevard project was awarded to Griffith Company of Los Angeles. This project lies between Conejo Creek and Camarillo, a distance of about 2.3 miles. It will be graded and paved with asphalt concrete. The roadbed is to be constructed to a width of 40 feet with 20 feet of surfacing. The contract price is \$38,288.50.

A third Coast Highway project, this one in Orange County, was awarded to the Macco Construction Company, Inc., of Clearwater, California. This project lies between Sunset Beach and Newport Beach, a distance of 6.4 miles. It will be graded and paved with Portland cement concrete. The roadbed is to be from 90 to 100 feet wide and the present pavement is to be widened to 30 feet. The wide roadbed will provide much needed parking space. The contract price is \$201,545.15.

A contract for another widening job on the Coast Highway was awarded to the Cornwall Construction Company of Santa Barbara. This project is situated in Santa Barbara County between Eagle Creek and El Capitan Creek, a distance of 5.5 miles. The road will be widened with oil-treated crusher-run base. Contract price is \$17,483.70.

LOS ANGELES TO BISHOP HIGHWAY—A contract for grading and surfacing with oil-treated crushed gravel or stone, 21.3 miles of this road was awarded to the Allied Contractors, Inc., of Omaha, Neb. This project is situated in Inyo County between Coso Junction and Olancha. The roadbed is to be 36 feet wide and the oil surfacing 20 feet wide. The project forms a part of the road from Mojave to Bishop. Adjoining this project on the north is a similar project recently completed. This work includes a general flattening out of the present undulating grades following closely the desert surface. The contract price was \$239,792.50.

PACIFIC HIGHWAY—Grier & Taylor of Oakland were awarded a contract for surfacing 26 miles of the Pacific Highway in Shasta County between Bayha and La Moine. The surfacing is to consist of untreated crushed gravel on the existing roadbed and stockpiling screenings for a future armor coat. The project lies north of Redding in the Sacramento River canyon. The contract price is \$59,941.50.

ALTURAS LATERAL—R. B. McKenzie of Red Bluff was awarded a contract to build six timber bridges on the Alturas lateral in Shasta County at points approximating from 40 to 60 miles east of Redding. The length of the bridges vary from one to seven 19-foot spans on frame bents with concrete pedestals. The contract price was \$18,653.

CUYAMA LATERAL—The Los Angeles Decomposed Granite Company was awarded a contract to surface 12.2 miles of the Cuyama lateral with oil-treated crushed gravel 20 feet wide. This project lies in Kern County between Pentland and the San Emigdio Road. The Cuyama lateral is a secondary highway from the San Joaquin Valley south of Bakersfield to the coast at Santa Maria. It carries a very considerable trucking traffic to the west side oil fields. The contract price was \$50,379.40.

CHOLAME LATERAL—A contract for grading a roadbed 36 feet wide and placing a bituminous macadam pavement 20 feet wide on 2 miles of the Cholame lateral was awarded to the Hartman Construction Company of Bakersfield. This section lies east of Lost Hills in Kern County. It is a portion of the Cholame Pass Road and the new section eliminates two dangerous right-angle turns. The contract price was \$41,993.40.

REDWOOD HIGHWAY—The Engelhart Paving Company of Eureka was awarded a contract for surfacing 7.3 miles of highway in Humboldt County between Dean Creek and Fish Creek. The surfacing is to be 18 feet wide and screenings are to be stockpiled for future bituminous surface treatment. The project is located about 50 miles south of Eureka along the banks of the Eel River. The contract price is \$27,050.

A similar project in Mendocino County covering a distance of 8.7 miles was awarded to Hemstreet & Bell of Marysville for \$37,330.

Siemer & Kendall and J. F. Main of San Anselmo were awarded a contract for an overhead crossing over the Northwestern Pacific tracks near Greenbrae in Marin County. The crossing will consist of one 38-foot and two 21-foot reinforced concrete girder spans on concrete piers and abutments. The structure will provide a clear roadway width of 44 feet. This overhead structure is located on new alignment of the Redwood Highway between San Rafael and Sausalito. The railroad will bear one-half of the total cost. The contract awarded by the Division of Highways was for \$17,190.

A second overhead crossing over the tracks of the same railroad, this one at California Park, in Marin County, was provided for in a contract awarded to Frederickson & Watson and Frederickson Bros. Construction Company of Oakland. This structure will consist of one 150-foot steel truss span on concrete piers, one 41-foot and one 28-foot steel beam spans on structural steel bents and 686 feet of timber trestle on pile and frame bents. A clear roadway of 44 feet 6 inches is provided. This structure is also on relocation between San Rafael and Sausalito. This relocation shortens the distance between these two points 4 miles. The question of the extent of participation of the Northwestern Pacific Railroad Company in the cost of this structure is now before the California Railroad Commission for determination. The contract price was \$121,683.

The Butte Construction Company of San Francisco was awarded a contract for constructing a bridge across Corte Madera Creek at Greenbrae in Marin County. The bridge will consist of a bascule span over a clear channel of 40 feet, and approximately 355 feet of timber trestle approaches on pile bents. The contract price was \$157,339.50.

MOTHER LODE HIGHWAY—The second oldest bridge in the state, a suspension structure across the North Fork of the American River, 2.5 miles east of Auburn. The new bridge will be a suspension span 322 feet in length with a clear roadway of 12 feet. The selection of this type of bridge was governed by the fact that the permanent location of this river crossing is dependent upon the building of a dam below the sight, so that the loss will be held to a minimum when the permanent structure is erected. The old bridge was built in the early 60's and is in a very poor condition. This contract was awarded to Smith Brothers of Eureka for \$25,225.

CAJON PASS LATERAL—A contract for a reinforced concrete bridge near Cajon Station in San Bernardino County was awarded to Pittman & Hippenstiel of Riverside. The bridge will consist of three 20-foot spans on concrete piers and abutments with wing walls. It will have a clear roadway width of 34 feet. Approaches are to be graded to a width of 36 feet. Contract price was \$13,087.57.

SAN DIEGO-EL CENTRO HIGHWAY—De Waard & Son of San Diego were awarded the contract to construct a subway under the San Diego and Arizona Railroad near Coyote Wells in Imperial County. The subway is to be of steel beam, timber deck on concrete abutments. This subway is on the new alignment, constructed after the old road was washed out in 1926. The contract price was \$14,659.

There are poor people in the Tennessee mountains who live in such dilapidated shacks that every time it rains, they have to go out and get in the sedan.—*Kay Features.*

ACCEPTANCES OF HIGHWAY CONTRACTS

DEL NORTE COUNTY—Holderner Construction Co. of Sacramento for constructing various types of oil surfacing between Smith River and the Oregon line, Redwood Highway, 35.3 miles. Approximate cost \$186,000.

DEL NORTE COUNTY—Holderner Construction Co. of Sacramento for crushing and stockpiling rock between Crescent City and the Oregon line, Redwood Highway. Approximate cost \$15,100.

DEL NORTE COUNTY—J. E. Johnston of Stockton for constructing graded roadbed and placing untreated crushed stone surfacing from Klamath River and Wilson Creek, Redwood Highway, distance 7.2 miles. Approximate cost \$242,000.

EL DORADO COUNTY—Contract of Lord & Bishop of Oroville for constructing a bridge across Tallac Creek about 8 miles north of Meyers on the Placerville-Tahoe Road. Approximate cost \$9,600.

EL DORADO COUNTY—L. W. Hesse of Merced for constructing a graded roadbed between May's Station and the Nevada state line, Placerville-Tahoe route, 5.1 miles. Approximate cost \$40,700.

HUMBOLDT COUNTY—Kern & Kibbie of Portland for furnishing and placing untreated crushed gravel or stone surfacing and stockpiling broken stone and screenings for bituminous macadam between Little River and Trinidad, Redwood Highway, 4.3 miles. Approximate cost of \$28,600.

HUMBOLDT COUNTY—Ellison & Smith of Fort Bragg for constructing graded roadbed and placing crusher-run base between Mad River and Mill Creek, Redwood Highway, 0.9 of a mile. Approximate cost \$37,900.

HUMBOLDT COUNTY—Butte Construction Co. of San Francisco for constructing a bridge and timber approaches about 4 miles north of Arcata, Redwood Highway. Approximate cost \$78,000.

HUMBOLDT COUNTY—Englehart Paving Const. Co. of Eureka for placing untreated crushed rock surfacing and stockpiling bituminous macadam rock between Big Lagoon and Orick, Redwood Highway, distance of 3.3 miles. Approximate cost of \$33,500.

HUMBOLDT COUNTY—E. C. Coats of Sacramento for constructing graded roadbed between Loleta and Beatrice, Redwood Highway, 3.7 miles. Approximate cost of \$113,900.

LAKE COUNTY—Hemstreet & Bell of Marysville for placing oil-treated crushed rock surfacing between High Valley Creek and Abbott Mine, on the Ukiah-Tahoe route, 15.6 miles. Approximate cost of \$111,200.

LASSEN COUNTY—F. H. Nielson, contractor for constructing timber bridge and cattle passes near Doyle on the Red Bluff-Susanville lateral. Approximate cost \$34,000.

LASSEN COUNTY—C. C. Gildersleeve of Felton for constructing an undergrade crossing under tracks of Western Pacific Railroad near Doyle on the Red Bluff-Susanville lateral. Approximate cost \$21,100.

LASSEN COUNTY—Meyer Rosenberg of San Francisco for constructing graded roadbed between Doyle and Long Valley Creek on the Red Bluff-Susanville lateral, distance 5.5 miles. Approximate cost \$51,500.

LOS ANGELES COUNTY—Gibbons & Reed, Burbank, for surfacing certain crescent shaped areas with bituminous macadam between 0.8 of a mile north of Sandbergs and $2\frac{1}{2}$ miles north of Sandbergs, main Valley route, at an approximate cost of \$13,900.

LOS ANGELES COUNTY—Griffith Company of Los Angeles for constructing a graded roadbed and laying an asphaltic concrete pavement between Glendora and Claremont on the San Fernando-San Bernardino Road, 5.15 miles. Approximate cost \$333,500.

LOS ANGELES COUNTY—Gibbons & Reed of Burbank for constructing certain segments of bituminous macadam pavement between $1\frac{1}{2}$ miles north of Kelly's and $\frac{1}{2}$ mile north of Sandbergs, Valley route, 6.1 miles. Approximate cost \$117,300.

MARIN COUNTY—Granfield, Farrar & Carlin of San Francisco for constructing graded roadbed and placing bituminous macadam surfacing at Alto, Tiburon-Alto route, about 0.6 of a mile in length. Approximate cost \$26,100.

MONO COUNTY—D. C. Follis of Compton for grading at Hilton Creek, on Sausug-Owens Valley-Bridgeport Road, 1.6 miles. Approximate cost \$17,200.

MONO COUNTY—Montfort & Armstrong of Sacramento for constructing a graded roadbed and placing untreated crushed rock surfacing between McGee Creek and Convict Creek, Tioga Pass route, distance 3 miles. Approximate cost \$26,400.

ORANGE COUNTY—Steele Finley of Santa Ana for constructing a graded roadbed and placing Portland cement concrete pavement at Irvine, Coast route, 0.7 of a mile. Approximate cost \$70,700.

PLACER COUNTY—Tieslau Bros. of Berkeley for constructing graded roadbed surfaced with oil-treated crushed rock at Magra, Auburn-Truckee highway, $1\frac{1}{2}$ miles. Approximate cost \$23,600.

PLUMAS COUNTY—Charles Harlowe, Jr., of Oakland for constructing graded roadbed and surfacing with crushed gravel or stone between westerly boundary and $2\frac{1}{2}$ miles southwest of Chester on the Red Bluff-Susanville lateral, 6.2 miles. Approximate cost of \$111,600. /

SACRAMENTO COUNTY—George J. Ulrich Construction Co. of Modesto for building bridge across Arcade Creek about 11 miles east of Sacramento on the Auburn-Truckee road. Approximate cost \$13,100.

SAN BENITO COUNTY—W. A. Dontanville of Salinas for surfacing portion of state highway from 7 miles north of Salinas to and including the town of San Juan, 2.4 miles. Approximate cost \$11,000.

SAN BERNARDINO COUNTY—George Herz & Co. of San Bernardino for constructing graded roadbed and placing Portland cement concrete pavement between San Bernardino and Santa River bridge on the San Bernardino to El Centro route, distance 1.7 miles. Approximate cost \$67,400.

SAN LUIS OBISPO COUNTY—M. J. Bevanda of Stockton for constructing timber bridge with graded and surfaced approaches across Yerba Buena Creek north of Santa Margarita on the main Coast Route (bridge and 0.2 of mile approaches). Approximate cost \$9,900.

SAN LUIS OBISPO—M. J. Bevanda of Stockton for constructing graded roadbed and placing Portland cement concrete pavement between Cuesta and $1\frac{1}{2}$ miles south of Santa Margarita, Coast route, for a distance of 1.9 miles. Approximate cost \$104,500.

SANTA CLARA COUNTY—Tieslau Brothers of Berkeley for crushing and stockpiling coarse and fine screenings in stockpiles between La Honda Road and

Saratoga Gap, San Francisco-San Jose route. Approximate cost \$12,200.

SAN MATEO, SANTA CLARA AND SANTA CRUZ COUNTIES—Twohy Bros. and J. F. Shea Co. of San Francisco for constructing graded roadbed and placing untreated crushed rock surfacing between La Honda Road and Saratoga Gap, Skyline Boulevard, 13.8 miles. Approximate cost \$712,400.

SISKIYOU COUNTY—M. B. McGowan of San Francisco for constructing a reinforced concrete bridge across Shasta River, Pacific Highway, 5 miles north of Yreka. Approximate cost \$29,600.

SOLANO COUNTY—Frederickson & Watson Const. Co. of Oakland for constructing a graded roadbed and placing bituminous macadam surfacing between westerly boundary and $1\frac{1}{2}$ miles west of Cordelia in the Jamison Canyon, 2.2 miles. Approximate cost \$113,200.

TUOLUMNE COUNTY—Lilly, Willard & Biasotti of Stockton for constructing graded roadbed and placing oil-treated crushed rock surfacing between Sonora and Sullivan Creek, Mother Lode Highway, 1.6 miles. Approximate cost \$45,700.

RELATION BETWEEN CONTRACTORS AND DIVISION OF ARCHITECTURE

(Continued from page 11.)

The passage of this legislation will work to the advantage of the contractor as well as to the state, in that the contractor will know that he is competing only against prequalified substantial contractors.

To date, the response to the questionnaire has been very gratifying, and the forms are being rapidly returned. In time, it is hoped to have a complete file of information on all contractors.

Under the terms of the Contractor's License Act, another bill that received legislative and executive approval, a contractor is defined as one who furnishes and installs labor and material for another, the cost of which exceeds the sum of two hundred dollars. Therefore, the Division of Architecture must obtain information on many kinds of contractors. Practically all of the work handled by the Division is by contract, and separate contracts for most every kind of building construction are entered into in the course of a year. General contracts, or contracts for a whole structure, of course, predominate, but minor contracts for such items as sidewalks, linoleum, window shades, water wells and what not, all come in due course, and contractors for all such miscellaneous items must also be both prequalified and licensed.

The licensing of contractors is not a function of the Department of Public Works but comes under the Department of Professional and Vocational Standards, a newly created Department, authorized by the legislature of 1929.

STATE HIGHWAY PATROL ORGANIZED

(Continued from page 4.)

No. 17—San Bernardino and Riverside. Headquarters, San Bernardino. Inspector Lyle J. Sanard.

No. 18—Orange, San Diego and Imperial. Headquarters, San Diego. Inspector, F. Vallejo.

CAPTAINS PROMOTED

The reorganization will promote the following captains to the rank of district inspector: F. J. Duncan, Merced County; Henry Livingston, Monterey County; K. C. Murphy, Ventura County, and W. E. Snell, Kern County.

W. P. Greer, inspector in the Fresno district, has been assigned to duties as inspector at Sacramento. Paul Maxim, inspector in Colusa County, has been reassigned as captain in Colusa County. Inspector A. J. Ford of San Francisco has been transferred to Sacramento headquarters.

PATROL ASSIGNMENTS

The following have been assigned to patrol duty without decrease in their present rate of pay:

H. E. Blackwell, district inspector at Fresno; E. J. Bradley, inspector at Long Beach; A. B. Crane, inspector at Los Angeles; Dave Curson, inspector in Colusa County; Mervin Holden, district inspector in Santa Barbara County, R. H. Emmett, inspector in Los Angeles, G. W. Griffin, inspector at Salinas and F. J. Bly, inspector at Red Bluff.

SALARY AND EQUIPMENT

All salaries of the officers are now being paid directly by the state instead of from motor vehicle registration funds apportioned to the various counties.

Automobiles of a modest but serviceable type have been purchased for officers engaged in night patrol duty. Equipment will be furnished by the state.

Payment of all salaries by the state has numerous advantages. Under the old plan, counties with a small registration of vehicles could not afford to employ traffic officers, in spite of the fact that traffic was heavy in many such counties in the summer. Under the new plan the state will be able to send men to these counties when they are needed to handle traffic.

Indeed, the new plan is very elastic, permitting the transfer of men from one location to another as the needs of the time may demand.

The new schedule of salaries was worked out as a means of creating a standard wage

scale for all members of the patrol. Hitherto it was left to each county to fix the salaries, and the range was from \$150 to \$500 a month.

The new scale will wipe out the dissatisfaction that existed over these inequalities. It is based on the scale adopted by San Francisco and Los Angeles.

The scale of monthly salaries is as follows:

District inspectors, \$255 to \$285; captains, \$225 to \$250; patrolmen, \$175 to \$225.

OBJECTIVES OF ORGANIZATION

Every effort is being put forth to weld the new organization into a compact, energetic, highly-trained and fast-moving force of officers, each imbued with a sense of the responsibility of his job and with the necessity of maintaining the dignity and honor of the patrol.

Although the organization will not be military in character, the strictest discipline will be maintained, and the personal conduct of the officers, on and off duty, will be scrutinized carefully.

Strict obedience to the orders of superiors will be demanded at all times. Insubordination of any kind will be cause for dismissal from the patrol.

Uniformity of dress and neatness in appearance will be expected of every patrol member. This is being accomplished by the adoption of standard specifications for uniforms, in which every detail down to a buttonhole is described.

Officers are expected to maintain a dignified demeanor at all times while on duty. To this end smoking while on duty is prohibited. Nothing looks worse than to see a man in uniform trying to direct traffic with a cigarette or cigar in his mouth.

Uniforms must be kept neat, pressed and clean. Coats, if worn, must be kept buttoned.

Some of these regulations may seem arbitrary, but they go far toward impressing the public with the dignity and authority of the patrol and they impress the officer with a sense of discipline.

Plans are developing to require every officer to carry a first aid kit and to acquaint himself with first aid methods. This may enable the officer not only to save his own life upon occasion, but the lives of others involved in mishaps along the highways.

It is felt that the division of the state into traffic districts will assist in the task of welding the patrol into a compact body. The arrangement will bring the patrolmen into closer contact with their superior officers and bridge the gap between the motorcycle man and the central office.

INTERRELATION OF AIRWAY AND HIGHWAY TRANS- PORTATION

(Continued from page 6.)

maximum that can be taken out of a business day. Such an arrangement leaves the air traveler four business hours, or half a day, in return for the extra charge made for airplane passage. It is therefore essential that facilities in such cases provide for night flying so that not more than one-half of the business day will be consumed in the air.

The personal emergency group, of course, have no uniform necessity. From the records of one leading operator it appears that more of this group charter special planes than travel on regularly scheduled operations.

Close observation of recent airplane development leads to the conclusion that the airplane may do on the long haul what the automobile has accomplished within the short haul range. Previously to the advent of the motor vehicle cities as we know them today were economically impossible. The speed and mobility of the automobile has extended metropolitan influences over a much broader range. The result has been that socially and economically city and county have merged. They retain separate identities only in political form and the present tendency is to eliminate the duplication of administrative effort by combining city and county governments.

It is entirely possible that the airplane, coming into general use, will extend this community interest over areas composed of whole states or parts of several states. Airplane passenger travel may bring points two hundred miles distant as close to city hall as are the present outskirts of any large city, provided airport facilities and highways to the business center are adequate. Similarly, by annihilating distance, airplane carriers may draw the great cities of the nation together.

Express is the third class of commodity opened to American airway transportation. While the volume of this type of service has not yet reached large proportions, it may eventually become a very important function of air transportation.

Starting in 1926, the development of airplane transportation has been very rapid, until in 1929 there are approximately 30,000 miles of airways of which 11,000 miles are lighted for night flying.

There are established at this time in the United States in excess of 425 municipal airports, 415 privately owned airports and 700 auxiliary airports. At the present time there are about 500 planes carrying mail in the United States. Forty-six air transport companies are flying 85,000 miles per day, about one-third of this mileage being flown during the night. Approximately 500,000 pounds of mail per month are being carried. Figures on passenger and express transportation for the entire country are not available. However, figures on the business of two of the largest airports on the Pacific coast—the Grand Central Terminal at Los Angeles and the Oakland Terminal at Oakland—may be indicative. At the present time the volume of traffic per month at the Oakland Terminal is approximately 13,300 passengers and 1500 packages of express; at the Grand Central Terminal the monthly traffic is about 5100 passengers and 500 packages of express.

I have very briefly sketched the present scope of

airway transportation. In all classes of such transportation the time between start and end of journey, including the item consumed in traveling between the airports and city, is the prime factor.

Were the established airway routes superimposed on a highway map of the United States it would be seen that the airways very closely follow the routes of the main highways. This is only natural when it is considered that, in overcoming topographical barriers, it is as economical for an airplane to seek the low summit in crossing a mountain range as it is for an automobile; that air transportation business lies between centers of population as does highway transportation; that emergency landing fields must be near a highway in order to function to the best advantage; that highways properly marked may serve as navigation aids to the airplane navigator.

Airways are composed of terminal landing fields or airports, intermediate or emergency landing fields to be used by planes desiring to land before they have reached their terminal designation and other navigation facilities, such as lighting, marking, radio communication and meteorological service. Under the present plan the federal government has undertaken the primary care of the emergency landing fields, beacons and meteorological service, leaving the matter of terminal airports to the local authorities and private corporations.

The principal types of transportation to date have been waterway, railway, highway, and airway. With respect to the manner in which they were and are being developed, they fall into two classes. Waterway and railway were developed by private corporations at their own expense, with some federal assistance in the case of the railways and canals. These two classes provide at their own expense all of their facilities such as boats, docks, trains, stations, roadbeds, etc. The highways and airways are of a different class. The public furnishes all the facilities except the vehicle in the case of the highway, and the airship and some of the airport terminals in the case of the airway. It appears, therefore, that development of airway transportation is a public matter and requires public or governmental direction and assistance similar to that extended to highway transportation.

To call attention to some specific air transportation problems relating to highways: In order for an airway transportation route to be justified the total elapsed time for transporting a commodity from a point from which the commodity could be shipped by other means to the ultimate destination must be shorter or else there must be a financial saving. At the present time there is no financial saving, therefore there must be a time saving. An airplane travels twice or two and a half times as fast as any other form of transportation, but there is from thirty minutes to one hour consumed between the airports and the ultimate destination. The saving in time may be accomplished by locating the airport as closely as possible to the center of population, by constructing highways between the airports and the centers of population so designed as to reduce the time of reaching the center of population to a minimum, or a combination of both. There is also the opportunity of bringing adjacent communities tributary to an airport terminal by laying out arterial highways leading between them and the airport, thereby enabling them to have the advantage of faster transportation, and permitting the larger communities to be distributing points for airway commerce.

The constructing of the airports presents problems very closely related to highway construction, involving as it does location of the port, grading of the site

and surfacing of the ground from which the ships take off and on which they alight. The location of the port involves many problems common to highway location adjacent to large centers of population, such as property values, elimination of traffic congestion, etc.

With the development of vacation travel by airway, particularly the weekend travel to mountain lakes and isolated resorts, the future weekend congestion on recreational highways leading to resorts may be relieved, although there will be the necessity of providing suitable landing fields adjacent to such resorts. Such a development might result in postponing or even eliminating the necessity for constructing high type recreational roads leading to such resorts. Transportation of materials and supplies into these regions could be handled by means of a very low type of road.

With all the publicity and propaganda that has been put out favoring aviation, and the efforts of this country to make the people air-minded and to develop aviation, to date there has not been any extensive volume of private flying. At a recent meeting in Los Angeles of the State Chamber of Commerce, it was very clearly brought out by one of the speakers that airplanes are being rapidly manufactured but that the problem of their use has not been answered, and the factories are facing a serious overproduction.

Should private flying become popular and a machine of the flivver type with folding wings which could be run into one's garage be developed, small landing fields would be developed and these planes would have no effect on highway traffic other than to relieve congestion to a slight extent.

Illustrating the need for emergency landing fields for planes, there have been several instances in California where aviators were forced to land on the highway, one of these resulting in a wreck involving an automobile and a plane.

As indicating the trend of increase in flying compared with motoring, it is only necessary to compare the stage of improvement of the airplane at the close of the war and the number of private individuals using planes eleven years after the war with the progress and the increase in the volume of motoring during the same period.

The volume of traffic developed to date by airway transportation is not sufficient to make a very satisfactory determination of its effect on congestion of the highways leading to and from airports. There is nothing to indicate at this time that air transportation will not be a high-class transportation, supplemental to and with practically no effect upon the volume of highway transportation.

LABORATORY-ING CALIFORNIA'S HIGHWAYS

(Continued from page 21.)

- (c) Determination of percentage of bitumen in sample.
- (d) Determination of solubility of asphalt. State purpose.
- (e) Determination of loss at 325°. What value, why made?
- (f) Determination of penetration. Give weight, time, and temperature.
- (g) Determination of percentage of A. C. in asphaltic oils.
- (h) Determination of proper per cent of A. C. and oil from screen analysis.
- (i) Determination of oil stain test.
- (j) Determination of specific gravity of compressed samples.
- (k) Determination of specific gravity A. C. and oils.
- (l) Determination of flash and fire points.
- (m) Determination of stability by Hubbard and Skidmore methods.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

B. B. MEEK-----Director
GEORGE C. MANSFIELD-----Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 7 DECEMBER, 1929 Nov. 12

VIRGINIA—A booklet with the title, "Roads Are White Pages of History," designed as a key to inscriptions on Virginia highway historical markers, is being distributed by the State Commission on Conservation and Development, Richmond, of which William E. Carson is chairman and Elmer O. Pippin is executive secretary and treasurer.

The man who deals in sunshine
Is the man who gets the crowds.
He does a lot more business
Than the one who peddles clouds.

—Schenectady Rotary Bulletin.

No mere man can ever understand why a woman will pay five dollars for a pair of stockings that give the impression that she isn't wearing stockings.—*Arkansas Gazette.*

- (n) Determination of water in oil.
- (o) Describe equipment used and its operation.

(4) Steel—Castings—Timber—Expansion Joints.

Describe tests made and methods of sampling and testing:

- (a) Phosphor bronze
 - (b) Cast steel
 - (c) Reinforcing steel
 - (d) Structural steel
 - (e) Culvert steel
 - (f) Asphalt dipping metal culverts
 - (g) Drain tile
 - (h) Timber (redwood, Douglas fir, pine—creosoted)
 - (i) Expansion joint material
 - (j) Equipment used and its operation.
- How can inspected steel be identified in the field? What is meant by yield or elastic limit of steel? Ultimate strength?
- If a reinforcing bar fails on the bend test, what does it indicate?

(5) Chemical.

Describe:

- (a) Analyses made of concrete mixing water and state why made.
- (b) What constituents of highly mineralized water are likely to prove detrimental when used for mixing concrete?
- (c) Method of analyzing water for domestic use. What care should be taken in sampling, and what quantity for analysis?
- (d) Method of sampling metal culverts and size of samples.
- (e) Method of analyzing steel, bronze, culvert material.
- (f) How is soil sampled for alkali analysis and how is analysis made?
- (g) What are the alkalis?
- (h) How should paint be sampled when in (1) five gallon packages; (2) barrels?
- (i) Describe method of analyzing paints.
- (j) What chemical analyses are made of asphaltic (1) cements, (2) emulsions, (3) cut-backs?

A TYPICAL CASE OF HIGHWAY DEVELOPMENT

(Continued from page 9.)

could be safely utilized, and a determined demand for the alleviation of the dust menace were all prominent features. The comparatively heavy traffic, however, did not tax the capacity of the road so much as the narrow roadway and the continuous heavy traffic taxed the ability of motorists to stay on the road and safely make the speed desired. Suppression of the dust menace became a problem for discussion and experiment; the maintenance of the graveled surface became a burdensome expense under the fast traffic; and as the density and speed of traffic increased, accidents increased in a growing ratio. In fact, the road was rapidly outgrown, and in 1923 the decision was reached to reconstruct the fifty-mile section from the entrance to the mountains, ten miles north of Redding, to Dunsmuir.

One of the lessons learned was that motorists do not appreciate the difference between valley and mountain construction, but demand a high speed road in all sections, particularly on main routes. As the new construction was through that portion of the canyon route where the heavier grades and sharper curves were located, and where traffic was slowed up to the greatest extent, it was, of course, desirable to eliminate as much of the heavy curvature as possible.

It was planned to build the new highway years into the future, ahead of existing demands sufficiently to insure permanence. Initial plans drawn up were for alignment surpassing in excellence any previous mountain construction on this route. The width was planned for an ultimate twenty-four-foot roadway to be rock surfaced at the time of reconstruction and paved at a later date, when traffic increases demanded it.

The new location was carefully studied with relation to the new requirements, keeping in mind the use of the original work to as great an extent as practicable. It was found possible to use the old road extensively, but at several locations it was found economical or desirable to discard portions and place the alignment on an entirely new location.

These major changes were all quite radical departures from the old line, and effected very desirable improvements. Of eleven changes, seven resulted in material decreases in mileage, while all of them resulted in betterments in alignment and grade. On six of the changes the construction of new bridges was involved, aggregating a third of a million dollars in cost, whereby circuitous routes down into low crossings of canyons were eliminated, and most of the saving in distance was accomplished. These decreases in mileage, added to the minor savings in distance accumulating through the entire work, aggregate a total decrease of 5 miles over the first construction, and approximately 10 miles over the original county road. Curvature was reduced to a minimum radius of 300 feet, and in the later projects, where the contour of the country lent itself more readily to longer radii, to an even higher standard.

Grades are such that the modern automobile may maintain a speed of forty miles per hour throughout. The reduction in the rate of grade is not so material as the decrease in adverse grade. The cutting down of summits and the bridging of deep canyons provided the greater part of the reduction, while the elimination of numerous small dips and rolls contributed to it.

The driving time between the two cities has been still further cut, so that now an average driver,

attending strictly to the business of getting over the road, may make the trip in one and one-half hours. Improved alignment, a dustless surface and comfortable width take away the worry and fear which many motorists experience in the mountains, and the smooth surface provides an exhilaration and relaxation in place of former uneasiness, mental and physical.

The dust menace, one of the most disagreeable features of our early roads, was a detriment to traffic, and increased speeds and volume of traffic made the problem of its elimination both difficult and necessary. Persistent effort has had its reward, and present day roads of high type are as free from dust as a city street.

The reconstruction has a present width of twenty-six feet, upon which has been placed a twenty-foot course of crushed stone varying in thickness from six to eight inches. This crushed stone surface has been oil treated with heavy asphaltic oil, and the dust menace entirely eliminated. While this surface is adequate for present needs, it is, of course, a state of the ultimate improvement, as future increases in the volume of traffic and the greater economy in maintenance will bring about the construction of concrete pavement or other hard surface in time.

For the present legal speed of forty miles per hour, the reconstruction is amply safe, but probable future removal of the speed limit will doubtless bring with it a demand for further improvements in alignment, for the motorist of today demands a road equal to the speed capacity of his car. The past decade has seen an increase through this section from a summer peak of eight hundred cars to one of eighteen hundred daily, and traffic counts have indicated a yearly rate of increase which will double the volume of today in a period of ten years. The character of the traffic has shown a decided trend from light cars to a conspicuous percentage of heavy fast passenger buses and commercial trucks, adding to the burden of maintenance.

The first construction required eight years for its accomplishment, and was outgrown within ten years of its inception. Calculations of the earnings of this construction in operating costs and time saved show that the money was well spent and that the investment may be charged off as returned to the public with interest.

The reconstruction has required five years for completion, and at the present is capable of handling several times the traffic which passes over it. Savings have been effected which are not common knowledge to the public, but which justify the expenditure for the work.

The five-mile decrease in distance alone, with an average daily traffic of one thousand cars, coupled with the saving due to the elimination of maintenance, gives a comfortable total of \$93,000 yearly, which will pay over one-half of the interest on the investment. The values of the smoother dustless surface, the lesser grade, and straighter alignment are all factors which tend to reduce operation costs, but which are difficult to evaluate. However, assuming that these refinements save in mechanical operation the inconsiderable sum of one cent per mile, the saving in one year will total \$219,000. The value of the saving effected in time is remarkable, but must be partially based on assumptions. The saving of one and one-half hours in driving time and the average daily traffic of one thousand cars are definitely known. It may be reasonably assumed: first, that the average earning power of an individual is \$5 per day, which would mean in this case a saving of \$0.94 to each person passing over the road; second, that each machine,

(Continued on page 34.)

THE SAN GABRIEL DAM REPORT

(Continued from page 15.)

side, conditions are favorable to slumping of masses, such as the body of broken rock included in the recent "slide" at the northerly side of the west abutment excavation.

The test shafts, tunnels and borings so far made give little hope that the conditions described above will materially improve with continued excavation. These explorations indicate that no suitable foundation rock for a high masonry dam is available under portions of the west abutment to distances of at least 190 feet horizontally and 150 feet vertically beyond the present excavation lines.

East Abutment.

At the present time, the face of the east abutment excavation has the appearance of being less broken and more substantial than the west side. In excavating into this wall the rock has separated, leaving a face determined by a set of well-defined smoothed surfaces, nearly parallel to the natural slope at this side.

This coincidence of position of a plane of separation with the average slope of the canyon side is to an extent deceptive, for it gives less favorable opportunity to see the actual physical condition of the abutment rock than at the west side. In the top portions of the excavation, however, the same intricate combination of faulting and crushing appears as in the west side. There is reason therefore to anticipate that greater depth of excavation may show a similar degree of instability at other levels in this abutment.

While the present excavations and exploration tunnels in the east abutment give promise of more satisfactory foundations than are available in the west abutment, neither the tunnels nor the borings on this side extend far enough to definitely settle this point. Furthermore, even the best rears of rock in this abutment are sufficiently intersected by planes of weakness and joints, some of which contain soft material, to throw doubt on its suitability for a dam of the height proposed.

Canyon Bottom.

The bedrock in the floor of the canyon, as shown by the drill cores, and by the shafts now being put down, is of the same types of rocks as the canyon walls. In portions of many of the drill holes only a small percentage of core, or even no core, was recovered on account of the poor condition of the rock, and both fault-breccia and clay gouge are found in some of the cores.

The inference to be drawn from all available data that the foundation rock in the canyon bottom is more or less broken and is traversed by fault lines to an extent comparable to what is seen in the canyon side-walls and abutment excavations. There is good reason to believe that strongly developed lines of break run lengthwise as well as across the canyon floor. Weathering and oxidization are not so general at this lower level, although these effects in certain places reach as deep as explorations have gone.

FOUNDATION STRESSES

The curvature of the proposed dam is slight, and no portion of the waterload has been assumed to be carried by arch action. The dam has therefore been designed as a gravity section, making proper allowances for the curvature in plan. The maximum compression in the concrete as calculated for a dam 492.5 feet high is 41.7 tons per square foot. This maximum compression occurs at or near the downstream toe of

the dam with the reservoir full. With the reservoir empty a maximum compression of 31.2 tons per square foot is found to occur at or near the upstream heel of the dam. A compressive stress of 40 tons per square foot is generally accepted as safe practice for structures of this type, and with slight modification of the section, the stresses could in this case be reduced to 40 tons per square foot.

The calculated stresses are based upon the assumption that the resistance of the foundation rock is uniform at all points, and that every square foot of the foundation rock carries its proportion of the load. If substantial areas of the foundation rock are weakened by fault zones or other defects, such areas are rendered ineffective in supporting the structure and the more unyielding areas of the foundation rock will receive more than their proportion of the load. This result is due to the rigid nature of a concrete gravity dam, which will not yield sufficiently without rupture to impose its load upon the weakened and more yielding areas of the rock foundation. Where such conditions exist, the stresses in the concrete will be very materially increased, and might result in the failure of the dam.

The fundamental requirement for a high concrete gravity dam is that it be built on firm sound rock, of uniform compressibility. This condition does not exist at the San Gabriel site.

CONCLUSION

It is the unanimous opinion of this board that the foundation conditions are such that the dam proposed in Application No. D-175 can not be constructed without creating a menace to life and property.

SUPPLEMENTARY SUGGESTION

Site Suitable for Elastic Type of Dam.

While the primary purpose of this report as covered in the preceding pages is to advise on the safety of San Gabriel Dam, as proposed in the plans submitted by the Los Angeles County Flood Control District, the board, in its investigations, has come to the conclusion that the foundations and other conditions are suitable for a properly built flexible type dam of conservative proportions. Such a type would not only conform to foundation conditions, but would also provide a structure which can best withstand earthquake shock or earth movement.

The board is of the opinion that a combination earth and rock fill dam, placed by the hydraulic method with concrete core wall, can be safely constructed at the site under consideration. The location of the reservoir site above a thickly settled and highly improved valley necessitates unusual precautions in the design of the dam, such as limited height, adequate cut-off, large freeboard, flat slopes, and an ample downstream toe blanket. It calls for a spillway of generous capacity, designed for maximum flood occurrence. Unless conditions as now disclosed are found to be materially different upon further exploration, the board believes a safe dam of this general type can be constructed at this site. Such a dam should be of sufficient width up and down stream to provide a percolation distance (length of water travel) along the base of the dam, equal to at least eight times the maximum depth of water against the dam. In addition to these conservative proportions, the dam should be provided with a reinforced concrete core wall, extending a proper distance into the bedrock at all points, in order to increase percolation resistance. Sluiced material should also extend to bedrock in an open cut on the two sides of the core wall, the material immediately upstream from the concrete wall constituting

the impervious core, the material immediately below the core wall to consist of sand only. Such construction would prevent the travel of water in dangerous amounts either around or under the dam, and would provide a safe structure even though the concrete core wall were breached. The surface of the abutments above the crest of the dam should be brought to slopes that will prevent slides. Materials excavated to date from the abutments can be utilized in the earth and rock fill type of dam suggested above.

Respectfully submitted.

CHARLES P. BERKEY,
Consulting Geologist; Professor of Geology, Columbia University, New York.

G. A. ELLIOTT,
Chief Engineer and General Manager, Spring Valley Water Co., San Francisco, Cal.

M. C. HINDERLIDER,
State Engineer of Colorado, Denver, Colo.

GEORGE D. LOUDERBACK,
Consulting Geologist; Professor of Geology, University of California, Berkeley, Cal.

J. L. SAVAGE,
Chief Designing Engineer, United States Bureau of Reclamation.

IRA A. WILLIAMS,
Consulting Geologist, Portland, Oregon.

NEBRASKA—It is estimated that it will require 28,000 freight cars in Nebraska to move the material necessary in the season's road construction program.

NEW YORK—This state had 2,115,178 motor vehicles, about 7 per cent of all the cars in the world, in 1928. There were 1,836,968 operators and 757,118 chauffeurs licensed. Owners of automobiles paid \$34,884,546.50 in fees to the state during the year.

COLORADO—Motorists along the main traveled highways will soon be able to locate historic and scenic attractions by signs. The Colorado State Highway Department and the Motor Club of Colorado assisted by counties and civic and commercial organizations will furnish the signs and see to their placement.

"Can we play at keeping store in here, mamma?"
"Yes, but I have a headache, so if you do you must be very, very quiet."
"Oh, all right, mamma, we'll pretend we don't advertise."

Isn't it strange that princes and kings and clowns that caper in sawdust rings,
And common people like you and me, are builders of eternity?
To each is given a bag of tools, a shapeless mass and a book of rules,
And each must make, ere life has flown,
A stumbling block or a stepping stone.

—Author Unknown

A TYPICAL CASE OF HIGHWAY DEVELOPMENT

(Continued from page 32.)

including passenger buses and trucks, averages three occupants; and third, that one individual out of every five is engaged in productive business, the other four being occupied with affairs of no value to anyone. On these assumptions, the saving approximates \$206,000 yearly. These figures seem incredible at first thought, but there is little doubt that the saving in time and in operating costs on our improved highways is well high incalculable.

For the present, we have a highway which fulfills all of our needs and gives promise of handling future needs unless unprecedented demands are placed upon it. It is a typical case of the improvement accomplished all over the state during the past nineteen years, which in this instance has changed a mountain trail to a modern high class road; has cut the time of communication between the two cities at the extremes from a day's trip to a couple of hours; has changed a trip requiring physical endurance and stamina to one of relaxation and pleasure; has made a section of mountains and summer playgrounds easily accessible to the people of the state; has reduced the cost of operation manifold; and which has served to stimulate the growth of the entire section.

In order to show a comparison of the various factors of interest in this development, the following table has been compiled:

	Original county road	First highway construction	Present construction
Date discontinued	1922	1929	In use
Minimum curvature	25-ft. Rad	50-ft. Rad	300-ft. Rad
Minimum width	10 ft.	16 ft.	26 ft.
Road surface	Earth	Gravel	Oil surface
Distance	69 miles	64 miles	59 miles
Average time	8 hours	3 hours	1½ hours
Average speed	8 m.p.h	20 m.p.h	40 m.p.h
Av. summer traffic	50	800	1800

"That is a skyscraper," announced the guide.
Old Lady: "Oh, my! I'd love to see it work."

"Pappa vat is science?"
"My, how could you be so stupid! Science is dose tings vat say 'No smoking.'"

"Feed a cold and starve a fever," say the doctors.
What we would like to know is why every girl we take out has a cold instead of a fever.—*London Opinion.*

Hal—"Women's clothes weren't much of a problem in the Garden of Eden."
Doc—"No, all you had to do was love 'em and leaf 'em!"

"'You's a liah,'
"Say dat again, and I'll bust yore jaw.'
"Consider it said again.'
"Consider yore jaw busted.'"

Gwen—"So, when you went driving with Reggie you had to walk home? I didn't think that of Reggie."
Jen—"Oh, Reggie walked with me. The roadster really did run out of gas."—*The Garageman.*

State Highway Progress Reports

ALPINE COUNTY

The highway between Markleeville and Woodfords is being widened and surfaced. The Camino Construction Company is doing the widening. State forces are doing the surfacing.

AMADOR COUNTY

J. P. Holland's contract for grading 2.7 miles between Dry Town and Amador City, a portion of the Mother Lode Highway in Amador County, is complete. A contract has been awarded to Hemstreet & Bell for rock surfacing this job. This work is under way.

The Mother Lode Highway between Plymouth and Cosumnes River has been reconstructed practically throughout. J. P. Holland has completed the contract on the final portion.

CALAVERAS COUNTY

The grading job between Mokelumne Hill and San Andreas has just been completed by the Gabler Construction Company. This contract is on the Mother Lode Highway and eliminates the worst section of the road between the above towns. Bids were opened September 30th for surfacing this stretch with gravel. The Adams Co. were low bidders on this job.

COLUSA COUNTY

J. E. Johnston has a contract for placing bituminous macadam surfacing on existing pavement and constructing rock borders on each side of the existing pavement between Geneva (Berlin) and a point 2.6 miles northerly. Work will not be started until spring.

C. R. Merrill of Willows was awarded a contract for widening the roadbed between Colusa and Meridian. The work consists of widening the present narrow roadbed to a uniform width of 26 feet throughout. Work is under way and it is hoped to have it completed before winter rains set in. The financing of the project is from the State Highway Maintenance Fund.

DEL NORTE COUNTY

The Holdener Construction Company have completed their contract for oil surfacing 35 miles of the Redwood Highway from the new Hiouchi Bridge over Smith River to the Oregon line, and have also completed their contract for producing and stockpiling crushed rock for light bituminous surface work over the 22 miles of the Roosevelt Highway in Del Norte County between Crescent City and the Oregon line.

The bituminous surface was placed by state forces and was completed about the middle of October.

The Holdener Construction Company also have a contract for stockpiling crushed rock screenings over the 35 miles of the Redwood Highway between the Hiouchi Bridge over Smith River and the Oregon line. The work is well under way and is approximately 25 per cent complete.

The Webber Construction Company have completed their contract for constructing a concrete girder bridge over Hardscrabble Creek, approximately 6.7 miles east of the Hiouchi Bridge over Smith River.

J. C. Compton of McMinnville, Oregon, has completed the placing of bituminous macadam surfacing over 4 miles of the Redwood Highway, a point 5 miles east of Crescent City and the new Hiouchi Bridge over Smith River.

Drainage work over the same 4 miles is being accomplished by Smith Bros. who have the contract for placing perforated metal pipe underdrains. The work is approximately 25 per cent complete.

J. E. Johnston has just recently completed his two contracts in Del Norte County for grading and surfacing approximately 10½ miles of the Redwood Highway between the southerly Del Norte County line and Wilson Creek.

The Webber Construction Company have completed their contract for reinforcing 2 miles of the highway with crushed rock surfacing between the head of Richardson Creek and Klamath River.

EL DORADO COUNTY

Grading of 5.1 miles of the Lincoln Highway along the south shore of Lake Tahoe (May's Station to the Nevada state line) has been completed. The road, as constructed, is 36 feet wide with no sharp curves nor steep grades.

From Folsom to Placerville, construction of oil treated rock borders is nearing completion. The improvement is designed to correct the present narrow pavement and extremely sharp curves by placing 3-foot oil mixed rock borders which will provide a paved 18-foot traveled way, and will render this portion more capable of traffic demands to which this route is subject. Further improvement is being made by super-elevating curves with oil treated material and constructing additional width on the inside of curves to flatten alignment where possible. This contract was awarded to W. H. Larson and is financed from the State Highway Maintenance Fund. All work will be completed by December 1.

Between Riverton and Kyburz, on Route 11, the grading of 5.75 miles is in progress. As a forest highway, this is a cooperative project to which \$140,000 was subscribed as the state's share. This contract was awarded to G. E. Finnell and is under the supervision of federal engineers.

Between one mile north of Eagle Falls and three miles south of Meeks Bay, state forces are improving drainage conditions and placing disintegrated granite surfacing. The work is well under way and will be completed soon.

Hemstreet & Bell are working on a contract for surfacing with untreated crushed gravel that portion of the Mother Lode highway between Logtown and about 4 miles southerly. The work is being financed from the State Highway Maintenance Fund.

Nate Lovelace is working on his contract for grading between Bay View Rest and Eagle Falls. Progress is slow. If weather permits, the contractor will carry on his work through the winter.

HUMBOLDT COUNTY

The Webber Construction Company have the contract for producing and stockpiling bituminous macadam rock along the Redwood Highway for a 20-foot by 2-inch bituminous macadam between a point one mile south of Orick and the northerly Humboldt County line. It is intended that this rock shall be stockpiled during the winter in order that the Heafey-Moore Company, who have the contract for placing the bituminous macadam, may proceed with their contract as soon as weather permits next summer.

The Engelhart Paving and Construction Company have completed their contract for placing additional surfacing and stockpiling rock for bituminous macadam pavement on approximately 3.3 miles of the Redwood Highway between Big Lagoon and Orick. It is expected to let the contract for the placing of the macadam as soon as weather conditions permit next spring.

Kern & Kibbe have completed their contract for placing additional crushed rock surfacing of 4.3 miles of the Redwood Highway from Trinidad southerly to Little River and for stockpiling rock for bituminous macadam pavement over the same distance.

Heafey-Moore Company who have the contract for placing a 2-inch by 20-foot bituminous macadam pavement for the 10.7 miles between Mill Creek and Trinidad have completed that portion between Mill Creek and Little River, a distance of 6.4 miles.

The reconstruction of the highway between Mad River and Mill Creek, 0.9 mile, by Ellison & Smith, contractors, has been completed and the road is open to traffic.

Contractors Kennedy & Bayles have completed the grading and about 95 per cent of the surfacing for their contract of constructing the Redwood Highway between Arcata and Mad River.

The Butte Construction Company have completed the contract for the construction of the new bridge over Mad River and the new bridge and highway at this point are now in use by the traveling public.

It is expected that the construction of the overhead crossing of the highway over the Northwestern Pacific Railroad and the Arcata and Mad River Railroad, approximately one mile north of Arcata, will be completed during December, and that the new road between Arcata and Mad River will be open to traffic before the first of the year.

The grading of the new highway between Loleta and a point approximately $7\frac{1}{2}$ miles south of Eureka, a distance of 7.3 miles has been completed by E. C. Coats of Sacramento. It is expected that a contract for surfacing this road will be let as early next spring as weather will permit.

E. C. Coats has also been awarded the contract for grading and surfacing a 28-foot standard roadway on that portion of the Redwood Highway between Fish Creek Grove and Stephens Grove, a distance of 3.2 miles.

The contractor is clearing, placing culverts and com-

pleting all excavation possible before heavy winter rains stop his operations.

The work is approximately 5 per cent complete.

Bids were received on November 13 for the grading of a 28-foot standard roadway and surfacing with 8 inches by 20 feet of crushed rock surfacing, that portion of the Redwood Highway from Garberville, 1.2 miles northerly to Bluff Creek.

H. H. Boomer was the low bidder and it is expected that work will start on this section within the next month.

The Engelhart Paving and Construction Company were awarded the contract for producing and placing 4 inches of additional crushed rock surfacing over the highway between Dean Creek and Fish Creek, a distance of 7.3 miles. The contractor has not yet started the placing of the material.

INYO COUNTY

From the southerly boundary of Inyo County to Little Lake, a distance of approximately 9.8 miles, Fred W. Nighbert is the contractor and February 10, 1930, should see the completion of this project within the allotted time limit. B. M. Gallagher is resident engineer.

From Little Lake to Coso Junction, a distance of approximately 3.7 miles, Fred W. Nighbert was also the successful bidder on the project adjoining his present contract. This project will be completed early in April, 1930, B. M. Gallagher being resident engineer.

From Coso Junction to Olancha, a distance of approximately 21.3 miles, the contract was recently awarded to the Allied Contractors, with the date of completion being set late in September, 1930. It is planned that S. C. Risley will be resident engineer on this project, and will likely be under way at an early date.

Standard culvert headwall posts are being placed throughout District IX, under the supervision of Frank Hagen.

It is planned to place Niterday signs on the paved portions of District IX, and it is expected that the Automobile Club of Southern California will start placing these at once.

Work will start in a few days widening the road north of Independence, and the work will be done by day labor forces, under the direction of Paul Peak, foreman.

Work has just been completed south of Lone Pine for the oiling of 10 miles of shoulders, under the direction of Carl Cleland, foreman.

KERN COUNTY

Plans have been completed for the continuation of the grading of a standard 36-foot roadbed and placing thereon 20 feet of oil-treated surfacing, from the end of the present improvement at Cinco to 7 miles north of Ricardo, a distance of approximately 16 miles. This project will likely be advertised soon, and will close the gap between Mojave and Sherwin Hill Summit, which is approximately 20 miles north of Bishop, which will mean, when completed, a continuous pavement of nearly 200 miles.

From 7 miles north of Ricardo to Coso Junction, there are at this time, five contracts under way, all of which provide for the construction of a standard 36-foot graded roadbed and the placing of an oil-treated

surface 20 feet wide. The first of these contracts, extending to Freeman, a distance of approximately 10.2 miles, is under contract to G. W. Ellis Company, and will be completed early in February, 1930, and is under the direction of V. E. Pearson, resident engineer.

From Freeman to the northerly boundary of Kern County, a distance of approximately 13.9 miles, Bartlett & Mathews, Black & Hagey, are the contractors. While the completion date has been set for February, 1930, it is believed that a 60-day extension of time will be necessary to complete this project, which is under the direction of V. E. Pearson, resident engineer.

Work is progressing rapidly for the placing of oil road mix shoulders between the city limits of Mojave and Cinco, a distance of 18 miles. This work is under the direction of Carl Cleland.

The work of placing surfacing and oil mixing certain portions of the road between Mojave and Kramer is under way and will be completed in the next few days. This work is under the direction of Ed Monroe and Carl Cleland.

LAKE COUNTY

The grading of the Ukiah-Tahoe road between Clear Lake Oaks and Sweet Hollow Summit has been completed by convict labor forces. From the summit to Abbott Mine the 20-foot graded roadbed is being widened to 24 feet.

Hemstreet & Bell have completed a contract for placing 20-foot crushed rock and oil-mix surface from High Valley Creek to Abbott Mine, about 15.6 miles.

Construction of a graded road, surfaced with crushed gravel or stone is under way between Lucerne and Clear Lake Oaks. The work is being performed under contract by von der Hellen, Pierson and Logan. This project will probably be complete by the first of the year. The completion, however, is contingent on weather conditions.

LOS ANGELES COUNTY

The contract for a line change immediately north of the Newhall tunnel has been awarded to McCray Co. Construction is started on this work. It is expected that this contract will be completed about next June.

Work on paving crescent shaped areas on the Ridge Route with bituminous macadam has been completed by Gibbons & Reed, contractors. These areas were left unpaved when alignment on this route was straightened by the state day labor forces. Emulsified asphalt was used in this work.

The work of grading the Newhall alternate line between Tunnel Station and the Santa Clara River is rapidly nearing completion. LaTourneau & Lindberg are the contractors. It consists of grading a 46-foot roadbed, 8.6 miles long, and eliminates from this route the Newhall tunnel and several dangerous curves in the vicinity of Newhall and Saugus. It is expected this work will be completed about December 1st.

Immediately after the completion of this grading work, a contract is to be let for paving with Portland cement concrete, 30 feet wide.

The first contract on the La Canada-Mt. Wilson Highway for grading 2.6 miles of 40-foot roadbed was awarded to H. W. Rohl Company on August 14th. Good progress is now being made.

MENDOCINO COUNTY

State forces are widening and straightening the roadway between the sidehill viaduct about 4 miles north of Lane's Redwood Flat and Red Mountain Creek. The road is being graded to a 24-foot standard width and surfacing with 8 inches of crushed rock surfacing.

Contractors Hemstreet & Bell have been awarded the contract for placing 4 inches of crushed rock surfacing on portions of the Redwood Highway between a point 2 miles south of Arnold and the Sherwood-Laytonville Road. The placing of the surfacing has not yet started.

MONO COUNTY

In the vicinity of Hilton Creek, D. C. Follis has recently completed 1.60 miles of state highway, which has been graded to a standard 24-foot roadway.

Between McGee Creek and Convict Creek, approximately 3 miles of standard 24-foot grade has been constructed, and a 20-foot crushed rock surface placed thereon by Montfort & Armstrong. W. Mathews was resident engineer on both these projects.

Between Mattly Ranch and Leevining, C. S. Miles is the contractor for the construction of 2.20 miles of grading a standard 24-foot roadway, to be followed with a 20-foot oil-treated surface. The mixing on this project is practically completed. A crusher-run base is approximately 95 per cent complete. The Armour top surface will very likely not be placed this year, owing to the inclement weather conditions which now prevail in this area. S. C. Risley is resident engineer on this project.

Surveys have been completed between Bridgeport and near Coleville by locating engineer, W. S. Dilliver. Plans will be prepared on the latter section in 1930.

Work is ready to start on the removal of blind and sharp curves on Sherwin Hill. These curves after widening will make the road much safer and high speed.

MONTEREY COUNTY

On the Coast Highway between Chualar and Salinas rapid progress is being made on the reconstruction work. The roadbed is being widened to 36 feet and a 20-foot asphaltic concrete second story pavement is being placed. The Peninsula Paving Company is the contractor. Within the limits of this project at Spence there is a change of line and an underpass of the Southern Pacific tracks. The underpass and approach is under supervision of the Bridge Department, and Triberti-Massaro are the contractors.

A change of line is being made at San Ardo to accommodate a new bridge across the Salinas River. The bridge, under the supervision of the Bridge Department, is being constructed by Ben C. Gerwick, contractor. The change of line and approaches to the bridge, 1.5 miles in length, involve grading a 36-foot roadbed and placing a 20-foot Portland cement concrete pavement. Frederickson & Watson Construction Company and Frederickson Brothers are the contractors.

Plans are complete for a change of line at the Bradley crossing of the Salinas River on the Coast Highway. The Bridge Department are preparing plans for the structure.

On that portion, San Simeon-Carmel Highway, being constructed by convict labor, a new bridge over the Little Sur River has been completed by Lord and Bishop, contractors.

On the San Simeon-Carmel Highway a timber bridge of ten 19-foot spans is being constructed across Villa Creek. H. C. Whitty of Sanger is contractor. This is on the portion of this road being constructed by convict labor from the camp located at Salmon Creek.

On the San Simeon-Carmel Highway construction work is in progress with convict labor. Two camps are maintained. At Little Sur a crew of 95 men and two power shovels are working and between Villa Creek and Alder Creek about the same number of men with three power shovels are working. About 7.3 miles of graded roadway has been completed. Surveys for the location of the road are in progress between the two camps.

NEVADA COUNTY

The Callahan Construction Company are working on their contract for grading and surfacing between Indian Springs and Soda Springs near the summit of the Colfax-Truckee Road. Travel is maintained through the construction with little inconvenience. On account of the many difficulties encountered on this work, the progress has been slow and it is doubtful whether this work will be completed this year.

C. B. Adams was awarded the contract for grading and surfacing 11.7 miles between Nevada City and Washington Road, and this work is well under way. This section, consistent with the rest of the Ukiah-Tahoe Highway, will consist of a 24 foot roadbed. An oil mixed crushed rock surface, 20 feet wide, is to be placed by the terms of the contract. The grading is practically complete and about 4 miles of untreated surfacing has been placed. On account of weather conditions, it will be impossible to oil treat the surfacing until warmer weather. Accordingly, this work will not be complete until some time in June.

NEVADA AND PLACER COUNTIES

Improvement is under way between Roseville and one-half mile north of Androa Subway. The work is being done by J. E. Johnston. Bituminous macadam surfacing has been placed on the existing pavement and constructing rock borders is under way.

Between Airport and Indian Springs on Route 37, 9.3 miles of grading is in progress. This project covers the construction of a 28-foot roadbed and was awarded to T. E. Connolly. Construction will continue into next year.

ORANGE COUNTY

The contract for a line change 0.7 of a mile in length between Serra and San Juan Capistrano was awarded to Match Bros. on August 12th. This work consists of constructing a 40-foot graded roadbed with Portland cement concrete pavement, 20 feet by 7 inches. Work is about one-half complete.

A contract for a line change to connect up the overhead crossing of the Atchison, Topeka and Santa Fe Railway at Irvine has just been completed. It consisted of grading 0.7 mile and paving with Portland

cement concrete, 30 feet wide. Steele Finley was the contractor.

A contract for paving one-half width between Santa Ana and Anaheim was awarded on June 11th to Griffith Company. This section is 4.9 miles long. The paving work is being done in cooperation with Orange County, the state paying for a strip of pavement 28 feet by 7 inches, and the county paying for a like amount. The state's portion of this highway is completed and work has been started on the county's portion.

SACRAMENTO COUNTY

Larsen Brothers contract for grading and surfacing between Arno and McConnell on the highway between Sacramento and Stockton is well under way. This job will eliminate the dilapidated narrow trestles and road here.

SAN BENITO COUNTY

Surveys and the preparation of plans are in progress for bettering the alignment at several places, widening the roadbed and resurfacing the road between a point 3½ miles north of Hollister and the Pacheco Pass Road, a distance of five miles.

SAN DIEGO COUNTY

Work is in progress by the R. E. Hazard Contracting Co. of San Diego on constructing oil rock borders on portions of the Coast Route between the city limits of San Diego and Oceanside. It is expected that this work will be finished shortly after the first of the year.

A contract for grading the Rose Canyon Road between Balboa Avenue and Torrey Pines Road was awarded on August 13th to the R. E. Hazard Contracting Company. This section is 5.4 miles long and is to be a 46-foot graded roadbed. About one and one-quarter miles have been graded to date.

The contract for grading a roadbed 36 feet wide and placing of Portland cement concrete pavement 20 feet by 7 inches is in progress between Pine Valley and Kitchen Creek on the San Diego-El Centro Highway. It is expected that this section will be completed by the end of the year.

A contract for 4.5 miles of 38-foot graded roadbed between La Posta Creek and Miller Creek on the San Diego-El Centro Highway was awarded on May 27th to the Nevada Contracting Company. Grading is completed for a distance of about two and three-quarters miles.

A contract for grading 3.9 miles of 36-foot roadbed from Kitchen Creek to La Posta and paving with 20-foot by 7 inches Portland cement concrete was awarded on June 25th to Basich Bros. About two miles of rough grading is completed, and grading is now in progress on about one mile. This section is on the San Diego-El Centro Highway.

SAN JOAQUIN COUNTY

We have two contracts under way in San Joaquin County. The one between Mossdale and Banta, C. W. Wood, contractor, for grading and cement concrete

paving 3.1 miles, is progressing satisfactorily. This is on the highway between Stockton and Tracy, the main road to Oakland. The other is for grading and surfacing two line changes on the Hogan Road between Stockton and Manteca—the main highway between Stockton and Los Angeles. Lilly, Willard & Biasotti are the contractors. The work is well under way.

SAN LUIS OBISPO COUNTY

Work has been completed on grading and paving with 20-foot Portland cement concrete pavement between Cuesta and one and one-half miles south of Santa Margarita, a distance of 1.9 miles. This project greatly improved the alignment on the north side of Cuesta Grade. M. J. Bevanda was the contractor.

A line change 0.2 mile in length, including a 38-foot timber bridge has just been completed at the north edge of Santa Margarita, which eliminates a bad curve at that point. M. J. Bevanda was the contractor.

Work has been completed on resurfacing with bituminous macadam, the Cholame lateral from the Estrella River to the Sacramento Ranch, a distance of about six miles. A. Teichert & Son were contractors.

On the Coast Highway between Atascadero and Paso Robles, a distance of 9.6 miles, the road is being reconstructed with a 36-foot roadbed and a 20-foot asphaltic concrete pavement. In the vicinity of Graves Creek and Paso Robles Creek, is a major line change. The existing structure over Paso Robles Creek will be used, and a new structure has been constructed across Graves Creek under supervision of the Bridge Department. William Lane was contractor on the bridge and Steele Finley is contractor for the grading and paving.

In the town of Atascadero a local improvement district has awarded the contract to M. J. Bevanda for street improvements which include completing the street work full width through the town. This work is progressing.

Plans are nearly complete for the reconstruction of the Coast Highway from the Santa Maria River to Berros Hill, a distance of 7.2 miles.

Surveys have been completed for the reconstruction of the Coast Highway from San Luis Obispo to Cuesta Grade.

SANTA BARBARA COUNTY

On the Coast Highway near the Ventura County Line, a new bridge over the Southern Pacific track has been completed by Paul M. White, contractor. This structure is located on a major change of line 2 miles in length. This work, which is complete, involved grading a 46 foot roadbed and a Portland cement concrete pavement 30 feet in width. McCray Company of Los Angeles was the contractor.

Bids are being received on placing 4"x3'0" shoulders consisting of an oiled surface on crusher run base on the Coast Highway, west of Santa Barbara, between Eagle Creek and El Capitan Creek, 5.5 miles in length.

Plans have been completed for the reconstruction of the Coast Highway through Gaviota Canyon from Las Cruces to one mile north of Gaviota, 2.8 miles.

Plans are being prepared for the reconstruction of the Coast Highway from Wigmore to Zaca, a distance of 4 miles.

Surveys are complete and plans are being prepared for the reconstruction of a portion of the Cuyama

lateral from the third crossing of the Cuyama River to the Kern County line, a distance of 38.2 miles. A portion of this project is in San Luis Obispo County.

SOLANO COUNTY

A serious traffic hazard is now removed by the completion of the grading and surfacing with bituminous macadam of the highway through Jamison Canyon between Napa County and Cordelia. This job also involved the moving of several miles of pipe lines which supplies the city of Vallejo.

TUOLUMNE COUNTY

A grading job 1.6 miles long on the Mother Lode Highway, now completed, gives a much improved entrance to Sonora, "Queen of the Southern Mines." This road connects the old road with the Columbia-Sonora Road already paved with asphalt concrete several years ago. Noble Brothers are the contractors. A contract for surfacing this job will be advertised in the near future.

Another job in the same vicinity is now completed. This is the Lilly, Willard & Biasotti contract for grading and surfacing with oil rock pre-mix of 1.6 miles on the Sonora-Mono Road just east of Sonora.

YOLO COUNTY

Plans and estimate have been made and the state is preparing to proceed with the improvement of Mullen crossing of the Southern Pacific Railroad, south of Woodland. The work to be done consists of grading and paving with Portland cement concrete pavement on line change to eliminate the present jagged and rough crossing. The grading has been completed and agreement for paving is being prepared. Neon tube railroad crossing signs will be installed over the road on each side of the crossing.

The state highway between Bretona and Dunnigan will be improved next season under contract by J. E. Johnston. The work will consist of placing bituminous surface on existing pavement and constructing rock borders.

YUBA COUNTY

The state highway between Dry Creek and Morrison's crossing is being improved by placing bituminous macadam surfacing on the existing pavement, rock borders are to be constructed on each side of the pavement. The work is being done under contract by J. E. Johnston.

Says Abie: "Cohen, I've been to the bank to borrow some money, and they say all I need is that you should sign to this note your name. Then I can have all the money I need. Ain't that fine?"

"Abie," says Cohen reproachfully, "you and I have been friends for many years, and yet you go to the bank when you need money. Abie, you just go again to the bank and say that they should sign the note, and then Cohen will lend you the money!"

Record of Bids and Awards

HIGHWAY BID OPENINGS FROM OCTOBER 30 TO NOVEMBER 27

HUMBOLDT COUNTY—Between Dean Creek and Fish Creek, about 7.3 miles in length to be surfaced with untreated crushed gravel or stone. Dist. I, Rt. 1, Sec. B. Hemstreet & Bell, Marysville, \$33,120; E. C. Coats, Sacramento, \$31,568. Contract awarded to Englehart Paving Const. Co., Eureka, \$27,050.

HUMBOLDT COUNTY—Between Garberville and Bluff Creek, about 1.2 miles to be graded and surfaced with untreated crushed gravel or stone. Dist. I, Rt. 1, Sec. B. Contoules Const. Co., San Francisco, \$92,746; W. H. Hauser, Oakland, \$107,271; D. McDonald, Sacramento, \$94,897; Tieslau Bros., Berkeley, \$88,178; Mathew Const. Co., Sacramento, \$131,192; Kennedy-Bayles Const. Co., Oakland, \$111,704; J. E. Johnston, \$96,840; E. C. Coats, Sacramento, \$130,737; Young Bros., Berkeley, \$96,522; C. R. Johnson, Portland, \$94,070. Contract awarded to H. H. Boomer, San Francisco, \$74,997.25.

IMPERIAL COUNTY—Undergrade crossing under San Diego and Arizona R. R. near Coyote Wells, consisting of one single track timber deck with steel beams about 32 feet long on concrete abutments with wing walls and 0.19 of a mile graded roadway. Dist. VIII, Rt. 12, Sec. A. Geo. Herz Co., San Bernardino, \$19,899; V. R. Dennis Const. Co., San Diego, \$19,991; Gist & Bell, Arcadia, \$24,030; B. B. Boyd, San Diego, \$17,421; Monarch-Breen, San Diego, \$22,466; Lynch-Cannon Eng. Co., Los Angeles, \$17,810; R. E. Hazard Const. Co., San Diego, \$22,565. Contract awarded to De Waard & Son, San Diego, \$14,569.

INYO COUNTY—Between Coso Junction and Olancha, 21.3 miles to be graded and surfaced with oil treated crushed gravel or stone. Dist. IX, Rt. 23, Secs. H and I. Isbell Const. Co., Fresno, \$282,543; G. W. Ellis, Los Angeles, \$240,255; Hemstreet & Bell, Marysville, \$272,376; V. R. Dennis Const. Co., San Diego, \$26,083. Contract awarded to Allied Contractors, Inc., Omaha, Neb., \$239,792.50.

KERN COUNTY—Between Pentland and San Einigdio Road, 12.2 miles to be surfaced with oil treated crushed gravel or stone. Dist. VI, Rt. 57, Secs. B-C. Hartman Const. Co., Bakersfield, \$59,607; Hemstreet & Bell, Marysville, \$63,137; V. R. Dennis Const. Co., \$72,372; Tieslau Bros., Berkeley, \$57,774. Contract awarded to L. A. Decomposed Granite Co., Los Angeles, \$50,379.40.

KERN COUNTY—Between 5 and 7 miles east of Lost Hills, 2 miles of grading and surfacing with bituminous macadam. Dist. PI, Rt. 33, Sec. C. M. J. Bevanda, Stockton, \$47,073; Grier and Taylor, Oakland, \$54,689; Tieslau Bros., Berkeley, \$55,925; Pacific Pavement Co., San Francisco, \$48,615; J. F. Shephardson, Bakersfield, \$43,846; A. Teichert & Son, Sacramento, \$47,641. Contract awarded to Hartman Const. Co., Bakersfield, \$41,993.40.

LOS ANGELES COUNTY—Widening of bridge across San Gabriel River, on Foothill Boulevard, near Azusa, by constructing eleven 54-foot and one 31-foot reinforced concrete girder spans and twenty-one 18-foot timber trestle spans. Dist. VII, Rt. 9, Sec. G. S. M. Kerns, Long Beach, \$96,906; De Waard & Son, San Diego, \$94,462; Carpenter Bros., Inc., Beverly Hills, \$89,718; Whipple Engineering Co., Monrovia,

\$94,320; Oberg Bros., Los Angeles, \$91,721. Contract awarded to Johnson Const. Co., Los Angeles, \$88,054.95.

LOS ANGELES AND VENTURA COUNTIES—Between Calabasas and Conejo Summit, 19.6 miles to be widened with oil-treated rock borders. Dist. VII, Rt. 2, Secs. C, A and B. Gibbons & Reed Co., Burbank, \$62,146. Contract awarded to Southwest Paving Co., Los Angeles, \$51,361.

MARIN COUNTY—Overhead crossing over the N. W. P. R. R. near Greenbrae, consisting of one 28-foot and two 21-foot reinforced concrete girder spans on concrete piers and abutments with wing walls. Dist. IV, Rt. 1, Sec. C. C. C. Gildersleeve, Felton, \$17,500; MacDonald & Kahn, Inc., San Francisco, \$22,263; J. F. Barrett and H. H. Hilp, San Francisco, \$19,656; McDonald & Maggiora, Sausalito, \$24,001; M. B. McGowan, San Francisco, \$17,973; A. T. Howe, Santa Rosa, \$17,635; Frederickson and Watson Const. Co., \$19,701. Contract awarded to Siemer & Kendall, and F. J. Main, San Anselmo, \$17,190.

MARIN COUNTY—Overhead crossing at California Park over the N. W. P. R. R. One 150-foot steel truss span on concrete piers, and one 41-foot and one 28-foot steel beam spans with 686 feet of timber trestle. Dist. IV, Rt. 1, Sec. C. C. J. Nystedt, Sacramento, \$129,800; W. L. Proctor, Santa Rosa, \$126,190; Pan Pacific Piling and Const. Co., Los Angeles, \$145,209; MacDonald & Kahn, Inc., San Francisco, \$134,716; Rocca & Caletti, San Rafael, \$128,518; Lord & Bishop, Oroville, \$123,808; M. B. McGowan, San Francisco, \$126,156; Healey-Tibbetts Const. Co., San Francisco, \$126,780; Butte Const. Co., San Francisco, \$125,109. Contract awarded to Frederickson & Watson Const. Co., and Frederickson Brothers of Oakland, \$121,683.

MARIN COUNTY—Bridge across Corte Madera Creek at Greenbrae on the Redwood Highway, consisting of a bascule span over a clear channel of 40 feet and approximately 855 feet of timber trestle approaches on pile bents. Dist. IV, Rt. 1, Sec. C. M. B. McGowan, San Francisco, \$188,202; Pan Pacific Piling & Const. Co., Los Angeles, \$179,061; Frederickson & Watson Const. Co., Oakland, \$171,855; Rocca & Caletti, San Rafael, \$167,958; Lord & Bishop, Oroville, \$168,838; C. J. Nystedt, Sacramento, \$166,554; Fred J. Maurer & Son, Inc., Eureka, \$176,123; Healey-Tibbetts Const. Co., San Francisco, \$176,735; The Duncanson-Harrelson Co., San Francisco, \$166,806. Contract awarded to Butte Construction Company of San Francisco, \$157,339.50.

MENDOCINO COUNTY—Between 2 miles south of Arnold and the Sherwood-Laytonville Road, 8.7 miles to be surfaced with untreated crushed gravel or stone. Dist. I, Rt. 1, Secs. F and G. Tieslau Bros., Berkeley, \$37,575; McDonald & Failing, Tres Pinos, \$40,227. Contract awarded to Hemstreet & Bell, Marysville, \$37,330.

ORANGE COUNTY—Between Sunset Beach and Newport Beach, 6.4 miles to be graded or paved with Portland cement concrete. Dist. VII, Rt. 60, Sec. A. Matich Bros., Elsinore, \$203,100; Jahn & Bressi Const. Co., Los Angeles, \$203,004; C. G. Willis & Son, Inc., Los Angeles, \$208,988; Griffith Co., Los Angeles, \$208,214; Sander Pearson, Santa Monica, \$224,713. Contract awarded to Macco Const. Co., Inc., \$201,545.14.

ORANGE COUNTY—Cleaning and painting bridge across Santa Ana River, south of Huntington Beach. Dist. VII, Rt. 60, Sec. A. Industrial Maintenance Engineering Co., Los Angeles, \$2,600. Con-

tract awarded to L. A. Sandblasting Co., Los Angeles, \$2,350.

PLACER AND EL DORADO COUNTIES—Bridge across the north fork of the American River, 2½ miles east of Auburn, consisting of 322-foot suspension span with timber trusses and timber deck. Dist. III, Rt. 65, Sec. A. F. H. Nielson, Orland, \$30,248; E. B. Skeels, Roseville, \$26,317; Lord & Bishop, Oroville, \$25,640; Mathews Construction Co., Sacramento, \$26,995; Butte Construction Co., \$26,225; M. B. McGowan, San Francisco, \$29,930. Contract awarded to Smith Bros. Co., Eureka, \$25,245.

SAN BERNARDINO COUNTY—Reinforced concrete bridge near Cajon Station, three 20-foot spans on concrete piers and abutments with wing walls and 0.16 of a mile roadway grading. Dist. VIII, Rt. 31, Sec. B. Oberg Bros., Los Angeles, \$14,458; A. R. & Co., Rodenhamer, Hemet, \$17,496; Martin Green, San Bernardino, \$15,018; George Herz & Co., San Bernardino, \$16,989; Gist & Bell, Arcadia, \$14,316; Franklin B. Gridley, Pasadena, \$18,279; Whipple Engineering Co., Monrovia, \$14,710. Contract awarded to Pittman & Hippenstiel, Riverside, \$13,087.57.

SAN DIEGO COUNTY—Bridge across San Luis Rey River, near Oceanside, consisting of three 265-foot steel deck truss spans and two 60-foot stringer spans on concrete piers and abutments and grading and paving approaches with Portland cement concrete and bituminous macadam. Dist. VII, Rt. 2, Sec. C. Pan Pacific Piling and Construction Co., Los Angeles, \$287,912; Carpenter Bros., Inc., Beverly Hills, \$295,240; Sharp & Fellows Contracting Co., Los Angeles, \$311,218; Butte Construction Company, San Francisco, \$334,159; Chas. and F. W. Steffgen, San Diego, \$305,062; Edwards, Wilkey & Dixon, Los Angeles, \$334,498; S. M. Kerns, Long Beach, \$325,965; Lynch-Cannon Engr. Co., Los Angeles, \$291,359. Contract awarded to Gutleben Brothers, Oakland, \$281,542.

SANTA BARBARA—Between Eagle Creek and El Capitan Creek, about 5.5 miles to be widened with oil-treated crusher-run base. Dist. V, Rt. 2, Sec. G. Hunter & Richardson, Santa Barbara, \$21,562. Contract awarded to Cornwall Construction Co., Santa Barbara, \$17,483.70.

SHASTA COUNTY—Between Bayha and La Moine, 26 miles to be surfaced with untreated crushed gravel or stone. Dist. II, Rt. 3, Secs. B and C. Tieslau Bros., Berkeley, \$66,886. Contract awarded to Grier & Taylor, Oakland, \$59,941.50.

SHASTA COUNTY—Six timber bridges on Redding-Alturas lateral at points between 40 and 60 miles east of Redding, bridges varying from one to seven 19-foot spans on frame bents with concrete pedestals. Dist. II, Rt. 28, Secs. C and D. F. H. Nielson, Orland, \$24,464; O. N. Pierce, Portland, Ore., \$19,831; A. Young, \$33,270. Contract awarded to R. B. McKenzie, Red Bluff, \$18,653.

VENTURA COUNTY—Between Conejo Creek and Camarillo, 2.3 miles to be graded and paved with asphalt concrete. Dist. VII, Rt. 2, Sec. B. Osborn Co., Pasadena, \$45,526; Cornwall Construction Co., Santa Barbara, \$38,288; Southwest Paving Co., Los Angeles, \$43,249. Contract awarded to Griffith Company, Los Angeles, \$38,288.50.

NEW MEXICO—Bidding anew for greater touring business to the southwest, the highway department has recently published 50,000 copies of a highway map of the southwestern states. The map is being distributed free on request to touring bureaus and individuals all over the United States.

AWARD OF CONTRACTS DIVISION OF ARCHITECTURE NOVEMBER 12 TO NOVEMBER 29

STATE NURSERY near Swingle Station, Sacramento-Davis route; for painting work. Contract awarded to Zeb Knott of Richmond; price \$924.

WARD BUILDINGS, reconstruction of, Mendocino State Hospital, Talmage, for general work. Contract awarded to Sorensen and Haggmark of San Francisco; price \$98,900.

For heating and plumbing work on above building, contract awarded to Pemberton Heating & Ventilating Co. of Los Angeles; price \$16,200.

For electrical work, same buildings, contract awarded to Eddy Electric Co., Stockton; price \$2,390.

ADDITIONS TO PUBLIC WORKS BUILDING, Sacramento, for general work; contract awarded to Geo. D. Hudnutt, Inc., Sacramento; price \$12,061.

For complete mechanical work to above building; contract awarded to Latourrette-Fical Company of Sacramento; price \$1,853.

SAN DIEGO STATE TEACHERS COLLEGE, Library and Science Building, for general work; contract awarded to Pettifer Hunt Company of San Diego; price, \$182,930.

For heating, ventilating and plumbing work, same building; contract awarded to Pemberton Heating and Ventilating Co. of Los Angeles; price, \$33,500.

For electrical work, same building, contract awarded to the American Electrical Construction Company of Los Angeles; price, \$13,498.

TWO BARRACKS BUILDINGS, Veterans' Home, Napa County, for general work; contract awarded to J. F. Shepherd of Stockton; price \$272,036.

For complete mechanical work on the same building, contract awarded to Latourrette-Fical Company of Sacramento; price \$55,570.

WATER PERMITS AND APPLICATIONS

Permits to Appropriate Water, Issued by the Department of Public Works, Division of Water Resources, During the Month of November, 1929.

LOS ANGELES COUNTY—Permit 3356, Application 6325. Issued to Farmers and Merchants National Bank of Los Angeles, Cal., November 1, 1929, for 0.12 cubic foot per second from Unnamed Spring in Section 21, Township 7 North, Range 15 West, S.B.M. for irrigation and domestic purposes on 10 acres.

EL DORADO COUNTY—Permit 3357, Application 6031. Issued to Augusta H. Lemmon, Palo Alto, Cal., November 2, 1929, for 200 gallons per day from Lemmon Spring in Section 11, Township 12 North, Range 17 East, M.D.M. for domestic purposes. Estimated cost \$100.

RIVERSIDE COUNTY—Permit 3358, Application 4751. Issued to Palm Valley Water Company, Palm Springs, Cal., November 2, 1929, for 900 acre-feet per annum from Chino Creek in Section 7, Township 4 South, Range 4 East, S.B.M. for domestic purposes. Estimated cost \$2,500.

EL DORADO COUNTY—Permit 3359, Application 6092. Issued to Ruth C. Mermod, Fallen Leaf,

Cal., November 2, 1929, for 200 gallons per day from Unnamed Spring in Section 15, Township 12 North, Range 17 East, M.D.M. for domestic purposes. Estimated cost \$50.

EL DORADO COUNTY—Permit 3360, Application 6093. Issued to O. L. Sponsler, Palo Alto, Cal., November 2, 1929, for 200 gallons per day from Unnamed Spring in Section 15, Township 12 North, Range 17 East, M.D.M. for domestic purposes. Estimated cost \$50.

TRINITY COUNTY—Permit 3361, Application 6211. Issued to Gus A. Tinsley, Salyer, Cal., November 4, 1929, for 6 cubic feet per second from Corona Creek in Section 17, Township 6 North, Range 6 East, H.B., for mining purposes. Estimated cost \$3,000.

EL DORADO COUNTY—Permit 3362, Application 6384. Issued to Tandy & Theis, Richmond, Cal., November 4, 1929, for 2 cubic feet per second from Cosumnes River in Section 22, Township 8 North, Range 10 East, M.D.M., for mining purposes. Estimated cost \$250.

SAN BERNARDINO COUNTY—Permit 3363, Application 6293. Issued to R. H. Seals, Lucerne, Cal., November 5, 1929, for 0.5 cubic foot per second from Unnamed Spring in Section 15, Township 3 North, Range 1 West, S.B.M. for irrigation and domestic purposes on 40 acres. Estimated cost \$500.

AMADOR COUNTY—Permit 3364, Application 6377. Issued to Brooke Realty Company, Sacramento, Cal., November 5, 1929, for 0.046 cubic foot per second from Slate Creek in Section 15, Township 8 North, Range 11 East, M.D.M., for domestic purposes. Estimated cost \$700.

SAN JOAQUIN COUNTY—Permit 3365, Application 6386. Issued to T. Brandt Cross, et al., Stockton, Cal., November 6, 1929, for 4.55 cubic feet per second from San Joaquin River in Section 9, Township 1 South, Range 6 East, M.D.M., for irrigation purposes on 363.9 acres. Estimated cost \$5,000.

EL DORADO COUNTY—Permit 3366, Application 6414. Issued to Raymond A. Young, Sacramento, Cal., November 6, 1929, for 200 gallons per day from Unnamed Spring in Section 5, Township 11 North, Range 17 East, M.D.M., for use for domestic purposes. Estimated cost \$25.

SAN BERNARDINO COUNTY—Permit 3367, Application 6013. Issued to Oscar W. Peterson, Helendale, Cal., November 7, 1929, for 0.02 cubic foot per second from Quail Spring, in Section 10, Township 7 North, Range 3 West, S.B.M., for irrigation and domestic purposes on one acre. Estimated cost \$7.00.

EL DORADO COUNTY—Permit 3368, Application 6339. Issued to John U. Morrison, Fairplay, Cal., November 8, 1929, for 2 cubic feet per second from Cedar Creek in Section 3, Township 8 North, Range 12 East, M.D.M., for power purposes. Estimated cost \$500.

EL DORADO COUNTY—Permit 3369, Application 6275. Issued to Chas. P. and Myra J. Eells, Georgetown, Cal., November 8, 1929, for 0.05 cubic foot per second from Herrick Creek in Section 33, Township 12 North, Range 11 East, M.D.M. for irrigation and domestic purposes on 8 acres. Estimated cost \$200.

HUMBOLDT COUNTY—Permit 3370, Application 6309. Issued to J. F. Brown, Trinidad, Cal., November 9, 1929, for 0.1 cubic foot per second from an Unnamed Creek in Section 35, Township 9 North, Range 1 West, H.M., for irrigation and domestic purposes on 6 acres.

EL DORADO COUNTY—Permit 3371, Application 6404. Issued to George Cunningham, Lotus, Cal., November 9, 1929, for 2.5 cubic feet per second from South Fork American River in Section 18, Township 11 North, Range 10 East, M.D.M. for mining purposes. Estimated cost \$1,200.

RIVERSIDE COUNTY—Permit 3372, Application 6422. Issued to F. Wm. Seggie, Riverside, Cal., November 12, 1929, for 0.007 cubic foot per second from Mountain Lion Spring in Section 36, Township 3 South, Range 2 West, S.B.M. for domestic and irrigation purposes on 4 acres. Estimated cost \$400.

EL DORADO COUNTY—Permit 3373, Application 6334. Issued to U. S. Eldorado National Forest, Placerville, Cal., November 13, 1929, for 1000 gallons per day from unnamed stream in Section 21, Township 13 North, Range 17 East, M.D.M., for domestic purposes. Estimated cost \$400.

CONTRA COSTA COUNTY—Permit 3374, Application 6213. Issued to E. H. Stephenson, Oakland, Cal., November 13, 1929, for 0.1 cubic foot per second from Walnut Creek in Section 26, Township 1 North, Range 2 West, M.D.M., for irrigation purposes.

EL DORADO COUNTY—Permit 3375, Application 6403. Issued to Lora J. Knight, Santa Barbara, Cal., November 14, 1929, for 1 cubic foot per second from Unnamed Spring in Section 21, Township 13 North, Range 17 East, M.D.M., for irrigation and domestic purposes on 80 acres. Estimated cost \$2,000.

VENTURA COUNTY—Permit 3376, Application 5881. Issued to John H. Dunshee, Ventura, Cal., November 14, 1929, for 0.075 cubic foot per second from Santa Ana Creek in Section 24, Township 4 North, Range 24 West, S.B.M., for irrigation and domestic purposes on 6 acres. Estimated cost \$750.

LOS ANGELES COUNTY—Permit 3377, Application 4223. Issued to Glendora Consolidated Mutual Irrigation Co., Glendora, Cal., November 22, 1929, for 40 cubic feet per second from Big Dalton and Little Dalton canyons in Sections 21 and 20, Township 1 North, Range 9 West, S.B.M., for domestic and irrigation purposes on 2463.95 acres. Estimated cost \$4,000.

LOS ANGELES COUNTY—Permit 3378, Application 5203. Issued to Glendora Consolidated Irrigation Co., Glendora, Cal., November 22, 1929, for 28.5 cubic feet per second from Big Dalton and Little Dalton canyons in Sections 20 and 21, Township 1 North, Range 9 West, S.B.M., for domestic and irrigation purposes on 2463.95 acres. Estimated cost \$11,500.

SAN BERNARDINO COUNTY—Permit 3379, Application 5917. Issued to John C. Baldrige, Lucerne Valley, Cal., November 23, 1929, for 0.125 cubic foot per second from Bluebird Spring in Section 25, Township 5 North, Range 2 West, S.B.M., for use for irrigation and domestic purposes on 40 acres. Estimated cost \$2,000.

SIERRA COUNTY—Permit 3380, Application 6411. Issued to Standard Mining Co., Downieville, Cal., November 23, 1929, for 2.5 cubic feet per second from Sailor Ravine in Section 22, Township 20 North, Range 10 East, M.D.M., for power purposes. Estimated cost \$2,000.

TRINITY COUNTY—Permit 3381, Application 6273. Issued to J. J. Irving, Salyer, Cal., November 27, 1929, for 0.12 cubic foot per second from Swanson Creek in Section 29, Township 6 North, Range 6 East, H.M., for irrigation and domestic purposes on 10 acres. Estimated cost \$150.

TRINITY COUNTY—Permit 3382, Application 6274. Issued to J. J. Irving, Salyer, Cal., November 27, 1929, for 3 cubic feet per second from Pony Bar

Creek in Section 28, Township 6 North, Range 6 East, H.M., for mining purposes. Estimated cost \$50.

RIVERSIDE COUNTY—Permit 3383, Application 6023. Issued to U. S. San Bernardino National Forest, San Bernardino, Cal., November 29, 1929, for 0.006 cubic foot per second from Marion Creek in Section 6, Township 5 South, Range 3 East, S.B.M., for domestic purposes.

PLUMAS COUNTY—Permit 3384, Application 6186. Issued to Mrs. W. H. Day, Oroville, Cal., November 29, 1929, for 0.2 cubic foot per second from Jackass Creek in Section 16, Township 24 North, Range 6 East, M.D.M., for domestic and irrigation purposes on 15 acres. Estimated cost \$750.

SISKIYOU COUNTY—Permit 3385, Application 6372. Issued to John S. Werts, Forks of Salmon, Cal., November 30, 1929, for 0.025 cubic foot per second from Another Creek, in Section 9, Township 10 North, Range 7 East, H.M., for irrigation and domestic purposes on 10 acres. Estimated cost \$175.

Applications for Permit to Appropriate Water Filed With the State Department of Public Works, Division of Water Resources, During the Month of November, 1929.

NEVADA COUNTY—Application 6471. Charles H. Munro, Hobart Building, San Francisco, Cal., for 232.5 cubic feet per second from Middle Fork Yuba River, Bloody Run Creek and 6 unnamed tributaries, tributary to Middle Fork Yuba River. To be diverted in Section 13, Township 18 North, Range 9 East, M.D.M., for mining. Estimated cost \$1,540,000.

MONO COUNTY—Application 6472. Gilbert E. Humphrey, c/o W. T. Selleck, 213 S. Verdugo Road, Glendale, Cal., for 25,000 acre-feet per annum from (1) Adobe Creek, (2) River Springs, and (3) a series of wells tributary to Hammil Valley. To be diverted in Sections 20, 24, 11, 12, 13 and 14, Township 1 North, Range 30 East, M.D.M., Sections 19, 29, 30, 32, Township 1 North, Range 31 East, M.D.M., and Sections 5, 8, 17, 20, 29 and 32, Township 1 South, Range 31 East, M.D.M., for power purposes.

MONO COUNTY—Application 6473. Gilbert E. Humphrey, c/o W. T. Selleck, 213 S. Verdugo Road, Glendale, Cal., for 25,000 acre-feet per annum from (1) Adobe Creek, (2) River Springs, and (3) a series of wells tributary to Hammil Valley. To be diverted in Sections 20, 24, 11, 12, 13 and 14, Township 1 North, Range 30 East, M.D.M., Sections 19, 29, 30, 32, Township 1 North, Range 31 East, M.D.M., and Sections 5, 8, 17, 20, 29 and 32, Township 1 South, Range 31 East, M.D.M., for domestic and irrigation purposes.

SANTA CLARA COUNTY—Application 6474. Montezuma Mountain School for Boys, c/o C. M. Burleson, 444 61st Street, Oakland, Cal., for 1 cubic foot per second from Bear Creek tributary to Los Gatos Creek. To be diverted in Section 32, Township 8 South, Range 1 West, M.D.M., for irrigation purposes.

SAN BERNARDINO COUNTY—Application 6475. Aman Moore, c/o Cement Engr. Company, C. C. Chapman Building, Los Angeles, Cal., for one cubic foot per second from Unnamed Spring tributary to Cajon Valley. To be diverted in Section 2, Township 3 North, Range 7 West, S.B.M., for industrial purposes.

SAN BERNARDINO COUNTY—Application 6476. Aman Moore, c/o Cement Engineering Co., C. C. Chapman Building, Los Angeles, Cal., for one cubic foot per second from Unnamed Spring tributary to

Cajon Valley. To be diverted in Section 1, Township 3 North, Range 7 West, S.B.M., for industrial purposes.

INYO COUNTY—Application 6477. The Ballarat Mining Corporation, Ballarat P. O. Box 246, Trona, Cal., for one cubic foot per second from The Cliff Springs, tributary to Panamint Valley Sinks. To be diverted in Section 16, Township 21 South, Range 45 East, M.D.M., for mining, milling and domestic purposes.

INYO COUNTY—Application 6478. The Ballarat Mining Corporation, P. O. Box 246, Trona, Cal., for 0.03 cubic foot per second from Post Office Spring (Paint Mine) tributary to Panamint Valley Sinks. To be diverted in Section 12, Township 22 South, Range 44 East, M.D.M., for mining and domestic purposes.

MERCED COUNTY—Application 6479. C. L. Schmidt, c/o C. R. Perrier, Attorney, for 0.6 cubic foot per second from Dry Creek tributary to Merced River. To be diverted in Section 13, Township 5 South, Range 12 East, M.D.M., for irrigation purposes. Estimated cost \$500.

SAN BERNARDINO COUNTY—Application 6480. Aman Moore, 328 C. C. Chapman Building, Los Angeles, Cal., for 0.5 cubic foot per second from Unnamed Spring tributary to Cajon Valley. To be diverted in Section 12, Township 3 North, Range 7 West, S. B. M., for industrial purposes.

SAN BERNARDINO COUNTY—Application 6481. Aman Moore, 328 C. C. Chapman Building, Los Angeles, Cal., for 0.5 cubic foot per second from Unnamed Spring tributary to Cajon Valley. To be diverted in Section 12, Township 3 North, Range 7 West, S.B.M., for industrial purposes.

SAN BERNARDINO COUNTY—Application 6482. Aman Moore, 328 C. C. Chapman Building, Los Angeles, Cal., for 0.5 cubic foot per second from Unnamed Spring tributary to Cajon Valley. To be diverted in Section 13, Township 3 North, Range 7 West, S.B.M., for industrial purposes.

EL DORADO COUNTY—Application 6483. Franklin H. Cookinham and A. J. Minaker, 870 Market street, San Francisco, Cal., for 0.12 cubic foot per second from Unnamed Creek tributary to Cosumnes River. To be diverted in Section 16, Township 9 North, Range 10 East, M.D.M., for mining purposes. Estimated cost \$500.

NEVADA COUNTY—Application 6484. Siberia Mine, c/o E. B. Frost, Agent, Nevada City, Cal., for one cubic foot per second from Grizzly Creek tributary to Middle Fork Yuba River. To be diverted in Section 26, Township 18 North, Range 8 East, M.D.M., for mining purposes. Estimated cost \$2,500.

YOLO COUNTY—Application 6485. Constant Angle Arch Dam Co., c/o Don McKinney, Hobart Building, San Francisco, Cal., for 200,000 acre-feet per annum from Cache Creek tributary to Sacramento River. To be diverted in Section 5, Township 10 North, Range 2 West, M.D.M., for industrial and domestic purposes. Estimated cost \$12,000,000.

SUTTER COUNTY—Application 6486. Scott F. Ennis and Edward S. Brown, Box 304, Sacramento, Cal., for 60 cubic feet per second from Sacramento River tributary to Suisun Bay. To be diverted in Section 15, Township 14 North, Range 1 East, M.D.M., for irrigation purposes. Estimated cost \$41,000.

RIVERSIDE COUNTY—Application 6487. Idyllwild, Inc., Idyllwild, Cal., for 0.25 cubic foot per second from Marion Creek tributary to Strawberry

Creek. To be diverted in Section 6, Township 5 South, Range 3 East, S.B.M., for domestic purposes. Estimated cost \$2,300.

SAN MATEO COUNTY—Application 6488. C. S. Crary, c/o A. E. Chandler, 723 Balboa Building, Second and Market streets, San Francisco, Cal., for 0.1564 cubic foot per second from La Honda Creek tributary to San Gregorio Creek. To be diverted in Section 26, Township 6 South, Range 4 West, M.D.M., for domestic purposes. Estimated cost \$25,000.

SUTTER COUNTY—Application 6489. M. J. Newkom and H. E. Newkom, c/o Inman & West, Lawyers, McLean Building, Sacramento, Cal., for 11.14 cubic feet per second from Feather River tributary to Sacramento River. To be diverted in Section 35, Township 15 North, Range 3 East, M.D.M., for irrigation purposes. Estimated cost \$4,357.

SUTTER COUNTY—Application 6490. California F. Hale Estate, c/o Inman & West, Attorneys, McLean Building, Sacramento, Cal., for 11.14 cubic feet per second from Feather River tributary to Sacramento River. To be diverted in Section 3, Township 15 North, Range 3 East, M.D.M., for irrigation purposes. Estimated cost \$4,200.

TRINITY COUNTY—Application 6491. George E. Waggoner and Robert L. Little, 621 Manchester Drive, Inglewood, Cal., for 75 cubic feet per second from Stewart Fork and Deer Creek tributary to Trinity River. To be diverted in Section 3, Township 36 North, Range 10 West, M.D.M., for power purposes.

TRINITY COUNTY—Application 6492. George E. Waggoner and Robert L. Little, 621 Manchester Drive, Inglewood, Cal., for 100 cubic feet per second from Stewarts Fork and Deer Creek tributary to Trinity River. To be diverted in Sections 19 and 20, Township 36 North, Range 9 West, M.D.M., for power purposes.

TRINITY COUNTY—Application 6493. George E. Waggoner and Robert L. Little, 621 Manchester Drive, Inglewood, Cal., for 225 cubic feet per second from Stewarts Fork, Deer Creek, Owens Creek and Val Marte Creek, tributary to Trinity River. To be diverted in Section 6, Township 35 North, Range 9 West, M.D.M., Section 31, Township 36 North, Range 9 West, M.D.M., and Sections 13 and 25, Township 35 North, Range 10 West, M.D.M., for power purposes.

SISKIYOU COUNTY—Application 6494. Consolidated Copper Co., c/o J. F. Reddy, Liberty Bldg., Medford, Oregon, for 25 cubic feet per second from Elliott Creek tributary to Applegate Creek. To be diverted in Section 22, Township 48 North, Range 11 West, M.D.M., for power purposes.

SISKIYOU COUNTY—Application 6495. Consolidated Copper Co., c/o J. F. Reddy, Liberty Building, Medford, Ore., for 25 cubic feet per second from Middle Fork Applegate River tributary to Applegate River. To be diverted in Section 30, Township 48 North, Range 11 West, M.D.M., for power purposes.

HUMBOLDT COUNTY—Application 6496. Mr. Walter C. Hoffman, Star Route, Arcata, Humboldt County, Cal., for 0.03 cubic foot per second from Underwood Creek. To be diverted in Section 30, Township 7 North, Range 1 East, H.M., for irrigation and domestic purposes. Estimated cost \$100.

SAN MATEO COUNTY—Application 6497. Bernard Ford, Hillsborough, San Mateo County, Cal., for 0.175 cubic foot per second from El Corte de Madera Creek and its tributaries, tributary to San Gregorio Creek. To be diverted in Sections 5 and 6, Township 7 South, Range 4 West, M.D.M., for irrigation and domestic purposes.

SAN MATEO COUNTY—Application 6498. Bernard Ford, Hillsborough, Cal., for 0.08 cubic foot per second from El Corte de Madera Creek tributary to San Gregorio Creek. To be diverted in Section 6, Township 7 South, Range 4 West, M.D.M., for recreational purposes.

PLACER AND NEVADA COUNTIES—Application 6499. Bear River Water and Power Co., c/o J. L. Rollins, Colfax, Cal., for 111,020 acre-feet per annum from Bear River and tributaries, tributary to Feather River. To be diverted in Section 27, Township 15 North, Range 9 East, M.D.M., or Section 22, Township 15 North, Range 9 East, M.D.M., for power purposes. Estimated cost \$2,500,000.

RIVERSIDE COUNTY—Application 6500. United States National Bank, c/o Farrand and Slosson, Attorneys, 1028 Pacific Southwest Building, Los Angeles, Cal., for 5 cubic feet per second from Little Morongo Creek (surface and underground) tributary to Whitewater River. To be diverted in Section 24, Township 1 South, Range 4 East, S.B.M., for irrigation purposes. Estimated cost \$50,000.

RIVERSIDE COUNTY—Application 6501. United States National Bank, c/o Farrand and Slosson, Attorneys, 1028 Pacific Southwest Building, Los Angeles, Cal., for 8 cubic feet per second from Big Morongo Creek (surface and underground) tributary to Whitewater River. To be diverted in Section 3, Township 2 South, Range 4 East, S.B.M. for irrigation. Estimated cost \$20,000.

MADERA COUNTY—Application 6502. F. P. Burris and Associates, c/o J. W. Beebe, Redwood City, Cal., for 3 cubic feet per second from North Fork San Joaquin River tributary to San Joaquin River. To be diverted in Section 16, Township 3 South, Range 25 East, M.D.M., for power purposes. Estimated cost \$750.

PENNSYLVANIA—Traffic studies show that 43.8 per cent of vehicles on state highways go 50 miles or farther per trip.

MICHIGAN—Detroit is investing \$9,000,000 in street improvements this year. This figure includes \$3,000,000 for widening and resurfacing. Over 100 miles of new street surfacing will be laid down.

OHIO—The National Road east of Springfield is being widened, a 12-mile section having been let for \$445,000. This is the beginning of a program of widening this busy artery for its entire distance across the state.

MINNESOTA—Grading of 28.3 miles of highway on T. H. No. 35 between Hassman and Hill City is under way. Five jobs in progress make a total of 56.9 miles of grading. With work put under contract last spring, this will make a total of 276 miles built on permanent location this last summer.

"Whyfo' you all name yo' latest baby 'lectricity?'"

"Well, Sam, it's this way—my wife's name is Dinah, and my name is Mose, and if dynamos don't make 'lectricity I'd like to know why not."

The Treasury Department received the following letter:

"I have received your application, but as I already belong to several good orders I do not care to join your income tax at this time."—*Exchange*.

STATE OF CALIFORNIA

Department of Public Works

HEADQUARTERS: PUBLIC WORKS BUILDING, ELEVENTH AND P STS., SACRAMENTO

C. C. YOUNG-----Governor

B. B. MEEK-----Director

CORNING DE SAULES-----Deputy Director

DIVISION OF HIGHWAYS

CALIFORNIA HIGHWAY COMMISSION

RALPH W. BULL, Chairman, Eureka
J. P. BAUMGARTNER, Commissioner, Santa Ana
M. B. HARRIS, Commissioner, Patterson Bldg., Fresno
JOSEPH M. SCHENCK, Commissioner, c/o United Artists Studio, Santa Monica Blvd., Los Angeles
FRED S. MOODY, Commissioner, 640 Kohl Bldg., San Francisco
C. H. PURCELL, State Highway Engineer, Sacramento
GEORGE C. MANSFIELD, Secretary
HARRY A. ENCELL, Attorney, San Francisco

HEADQUARTERS STAFF, SACRAMENTO

G. T. MCCOY, Administrative Assistant
L. V. CAMPBELL, Office Engineer
T. E. STANTON, Materials and Research Engineer
FRED J. GRUMM, Engineer of Surveys and Plans
C. S. POPE, Construction Engineer
T. H. DENNIS, Maintenance Engineer
CHAS. E. ANDREW, Bridge Engineer
R. H. STALNAKER, Equipment Engineer
E. R. HIGGINS, Chief Accountant

DISTRICT ENGINEERS

F. W. HASELWOOD, District I, Eureka
H. S. COMLY, District II, Redding
CHARLES H. WHITMORE, District III, Sacramento
J. H. SKEGGS, District IV, San Francisco
L. H. GIBSON, District V, San Luis Obispo
E. E. WALLACE, District VI, Fresno
S. V. CORTELYOU, District VII, Los Angeles
E. Q. SULLIVAN, District VIII, San Bernardino
F. G. SOMNER, District IX, Bishop
R. E. PIERCE, District X, Sacramento
General Headquarters, Public Works Building,
Eleventh and P Streets, Sacramento, California

DIVISION OF WATER RESOURCES

EDWARD HYATT, State Engineer, Chief of Division
J. J. HALEY, Jr., Administrative Assistant
HAROLD CONKLING, Deputy in Charge Water Rights
A. D. EDMONSTON, Deputy in Charge Water Resources Investigation
R. L. JONES, Deputy in Charge Flood Control and Reclamation
GEORGE W. HAWLEY, Deputy in Charge of Dams

SPENCER BURROUGHS, Attorney
EVERETT N. BRYAN, Hydraulic Engineer, Water Rights

A. N. BURCH, Irrigation Investigations
H. M. STAFFORD, Sacramento-San Joaquin Water Supervisor
GORDON ZANDER, Adjudication, Water Distribution
KATHERINE A. FEENY, Chief Clerk
MABEL PERRYMAN, Secretary
S. T. HARDING, Irrigation and Special Investigations

DIVISION OF ARCHITECTURE

GEO. B. McDUGALL, Chief, Division of Architecture
P. T. POAGE, Assistant Architect
W. K. DANIELS, Deputy Chief of Division

HEADQUARTERS

H. W. DEHAVEN, Chief Architectural Draftsman
C. H. KROMER, Structural Engineer
CARLETON PIERSON, Specification Writer
C. O. PALM, Chief Clerk
C. E. BERG, Engineer, Estimates and Costs
J. W. DUTTON, General Superintendent Construction
W. H. ROCKINGHAM, Mechanical Engineer
C. A. HENDERLONG, Assistant Mechanical Engineer
W. M. CALLAHAN, Electrical Engineer

DIVISION OF MOTOR VEHICLES

FRANK G. SNOOK, Chief
EUGENE BISCAILUZ, Chief of California Highway Patrol

DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief

DIVISION OF PORTS

Port of Eureka—F. B. Barnum, Supervisor
Port of San Jose—Not appointed
Port of San Diego—Edgar A. Luce

STATE HIGHWAYS IN CALIFORNIA SHOWING THE PRIMARY AND SECONDARY ROAD SYSTEMS AND THE DIVISION OF THE STATE UNDER THE BREED BILL.



